COAL AGE

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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

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Why Leave Field to Central Power Companies?

MOST coal companies have been willing to ship coal by rail or by water. Few indeed have sought to send their power to market by wire and none through pipes. Surely the invasions of the power companies should awaken the desire in the minds of mine owners to put their power in such form that the demand would be steady and not fluctuating. The power companies are now going into the coal field, opening new mines and thus stripping the mine owner of a large part of the demand for his product, adding to the number of mines at a time when it is generally acknowledged that there are altogether too many mines for the well-being of anybody.

This would not be so bad if it were not for the fact that the power companies accepted what few consumers want, especially in the Middle West, namely fine coal. The market that is thus lost is the most desirable market of all. Without sale for slack, the coal operator is at his wits' end. Slack nearly always has faced a glutted market. The power companies crush their coal and with a few mines can supply what many mines were required to produce under the old conditions when a mine made not only fine coal but a large percentage of lump.

It is time to wake up, for it is now or never. The choice will not long remain open. Soon the power companies will have enough mines and enough power plants to take care of all requirements and then only distant markets can be supplied with fine coal. The mine owner should think over this matter seriously and get into the power-distributing business before all the opportunities are taken up. He has been thinking of the subject for years, but thinking does not consume fine coal nor does it give a steady market—unless that thinking leads to action.

Telling the World

SOME coal company executives do not care to write for publicity; others will not write, but allow their engineers to contribute to technical papers; while still others will not permit any of their employees to write or even speak for publicity. Strange as it may seem, if it is strange at all, the public and men of the industry invariably have a better opinion of a company that tells what it is doing than one that hides every move; in fact, there is a close relation between employee loyalty to the company and freedom of expression.

When the public knows little or nothing about an industry and realizes that its leaders are adverse to any publicity, it quickly comes to the conclusion that there must be something to hide. Similarly, when an employee is denied the privilege of exchanging ideas among his associates, he soon resents his company's close-mouthed policy.

Frequently we are astonished with the lack of correlated effort on the part of employees of the same company, and this condition is even more acute among engineers of different coal companies. Some companies and some engineers know very little about what other companies and engineers are doing. This condition does not promote rapid progress and is expensive and backward. Often a mining or engineering problem is solved and re-solved at great expense and even danger by individual companies and engineers which cost might have been entirely avoided had interchange of ideas been more general.

Director Bain, of the U. S. Bureau of Mines, has well said that if the twenty-six principal mining states had tried to establish, each for itself, separate experimental stations, the waste would have been enormous. Almost everything would have had to be tested twenty-six distinct times. The Bureau does the work once and for all.

Five thousand coal companies are each trying methods of saving in cost of mining and of developing better and safer ways of performing mining operations. What a waste if their effort is not correlated! What a loss to them all! This the technical press is endeavoring to save—is actually saving for the country.

The old-fashioned policy of hiding everything should be abandoned. Many engineers have been too silently doing their work and should now add to their training the art of self-expression, if they are to be of greatest value both to their companies and themselves.

Is This the Way at Your Mine?

AT SOME mining plants the electrical equipment is fully abreast with the times. The boilers are stoker-fired, the power house is equipped with modern turbines, the power is distributed at high potential to substations near the face where it is stepped down to mine voltage. Every modern electrical device is installed and the electrical engineers in charge have obtained kilowatt-hour costs comparable with the best.

But—and here comes in the mining engineer and the superintendent—no one has taken care of the bonding. That falls to the man who calls himself a mining man, and he, not caring about the electrical equipment, lets this important matter drift. The power so cheaply made, so efficiently distributed, is wasted in the roadways of the mine. No matter how energetically the electrical engineer may fill the barrel, the mining superintendent can empty it with his open spigot.

He can waste it at bonds, he can squander it over excessive grades, he can destroy the locomotives by his bad tracks, he can overload his machines by dull bits, he can overtax the electric system by carelessness in

distributing his loads over the day. There never was an electrical engineer but could be queered by a mining superintendent who would not co-operate with him.

A few conferences might correct this difficulty, but of the calling of conferences, there is no end. They tend eventually to "drivel," especially if not skilfully led and made a matter of careful study. But they do give hints of saving, at least when first started, and they do bring pressure to bear on those parts of the mechanism that oppose themselves to other parts, to those gears which do not mesh. And then there is turnover in officials. There are new elements to bring into line. There is forgetfulness also and a tendency of men to fall out of line if not continually faced with the necessity for co-ordination. The conference is well worth the time expended on it. Try it.

Furthermore, it might be well to give the electrical engineer authority over the bonding of the tracks on which he must rely to obtain his return, and a sympathetic hearing as to the tracks themselves, for upon them he must run his electrical equipment and as to the bits and the cutters from which he must get results without motor burnouts.

Dangerous, some one will say, this duplication of authority in a mine, but dangerous also, where there is no co-ordination, is division of authority regarding what are truly electrical matters. It is this division of authority that makes conferences essential.

Why Should They Complain?

BY THE provision of Section 28 of the "Jones," or Merchant Marine, Act only freight carried in American vessels is permitted to get the advantage of the railroad rates set for exported merchandise. Section 28 by its own provisions was held in abeyance till the U. S. Shipping Board should notify the Interstate Commerce Commission that American vessels can handle all the freight of any given kind to certain harbors. By the terms of the section the commission is obliged then to declare that Section 28 shall come into operation in regard to those ports.

As foreign ships can under their present wage scales underbid American ships and are doing so, this enforcement of Section 28 will raise the aggregate cost of exporting, for if the merchandise goes in American bottoms it will have to pay American shipping rates, which are higher than foreign, and if it goes in foreign bottoms it will have to pay, at least in many cases, higher railroad freights to American ports.

All this seems likely to cause retaliation from such foreign countries as are greatly interested in shipping, though such discrimination is not new. It already has been practiced by at least one other nation—Germany. However, foreign countries may not be opposed to this discrimination, for it raises export rates and tends to keep American goods from being exported and helps foreign goods to replace American goods, and thus does America, perhaps, more harm than Europe. Even the foreign shipping firms are not much injured, for they can engage more profitably then in European trade than they can today because that trade will be bettered by the exclusion of American goods. By our action we have raised a virtual tariff wall against our merchandize. In so far as any nation consumes our goods that nation finds the prices raised but its own merchants more active. In so much as that nation exports goods—and nations with merchant marines are most greatly interested in the differential treatment—it provides that they will do more business in the Eastern Hemisphere and less Transatlantic business. So the conditions partly, if not entirely, correct themselves.

It is our merchants who, by being shut out of European markets, bear the loss. But certain railroads and seaport towns will share it. The railroads leading to ports where there is now no differential or only a small one will charge under the law no more, or but little more, as the case may be, to foreign ships and so will take traffic from those where the differential is high. Those ports with no or low differential also will gain. Other railroads and ports will lose. Consequently interests in this country will conflict. This matter, which is in a sense a tariff issue, like the tariff will be a matter of local interest. One section of the country and one group of interests will be pitted against another. Which will win is not at present apparent.

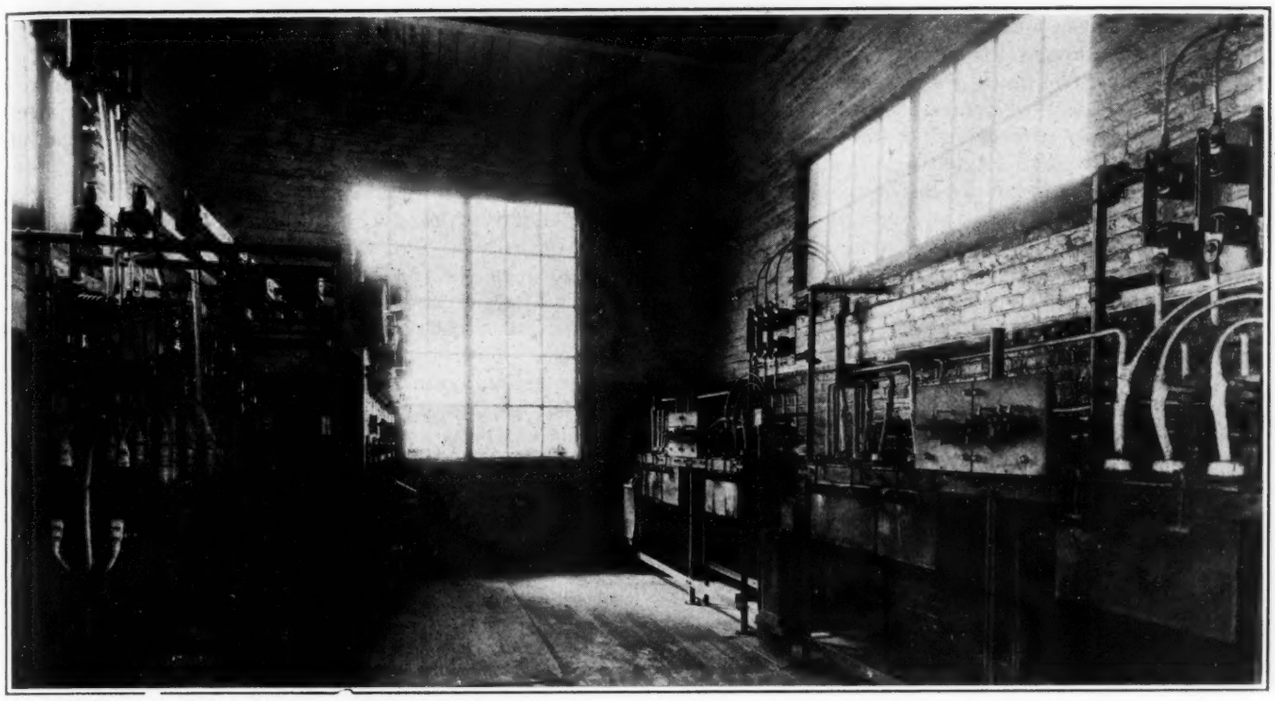
This matter might be of interest to the coal industry should there be a British coal strike, which now, however, appears unlikely. But the railroads have decided, after a conference, that we never have had a differential on export coal. True we have a tidewater rate, but it was made for shipments to New England, not for foreign trade. The foreign trade simply availed itself of it.

Consequently, say the railroads, we have never had an export differential, and accordingly it cannot be legislated out of existence by making Section 28 operative. Whether the railroads are correct in that conclusion the Interstate Commerce Commission must decide. If the commission declares that there is an export differential in favor of coal, that decision might hinder the shipment of coal if, owing to a British or other coal strike, there should be a demand for it.

Certainly this arrangement, by excluding American goods from Europe, will help that continent to restore its balances and aid it to pay its debts. European nations, within themselves, have conflicting interests such as are found here. Hence nothing is likely to be done. Several countries, including Holland and Japan, have protested, but protest probably will not avail. The matter will be regarded as an internal matter by the American people. It offends foreign countries, which do not like interference with their merchant marines. This is unfortunate to be sure.

Second thoughts, however, may make these nations less critical as second thoughts are making the American people question the validity of the judgment which caused the enactment of Section 28. It is too early to tell whether the section will stand or fall. This, however, is sure, we can no longer feel our former enmity toward foreign discrimination. We always have had our restrictions against merchandise being carried coastwise in foreign bottoms. Now we have this further restriction, so we no longer are able to wonder at the ship subsidies that foreign nations have been disposed to provide to the disadvantage of the American merchant marine and at the expense of their own national budgets.

THE KENTUCKY COAL "BARRENS" ought to be happy. They have defeated the tonnage tax bill and had no 1923 taxable income worthy of note. Now all they have to do is fight for life.



Control House for Substations

Motor-Generator Sets in Two Substations Operated In Parallel and Controlled from Surface

To Keep Controls from Dust They Are Installed in Colliery Yard—Two Generators of Unequal Capacity Successfully Worked in Parallel—Method of Lowering Cables—Use Unarmored Cable in Borehole

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At the Dorrance Colliery of the Lehigh Valley Coal Co., at Wilkes-Barre, Pa., two substations have been equipped with semi-automatic substation equipment to supply direct-current energy for a typical mine load but in a way somewhat unusual. One of the unusual features is the placing of the greater part of the control equipment in a separate building on the surface, the two motor-generator sets being located about 2,500 ft. from the control house on two separate levels inside the mine. About two-thirds of the mine output comes from the 650-ft. level where one of the machines is located, and the other third from the 1,150-ft. level where the other machine supplies the necessary energy.

The power for this colliery was originally supplied from a 300-kw. generator directly connected to a tandem compound engine and a 175-kw. generator directly connected to a simple engine. Both generators were compound-wound and delivered 250 volts. The former unit has been in service 15 years and the latter 20 years, running from 12 to 18 hours daily. Both units are still in good operating condition.

It might be of interest to note here that these two generators were successfully paralleled, in spite of their widely different design, by connecting the series field of one machine in series with the other. A cast grid rheostat shunt was connected across the terminals of the field so as to shunt enough current to compensate for the difference in the capacities of the generators.

Owing to the rapid advance of the mining face, some of the inside power feeders had been extended nearly 5,000 ft. This, of course, caused excessive line drop, and a pressure at the locomotives as low as 150 volts was not uncommon.

At the locations selected for the converting substations there was no one who could attend to the stations in connection with his other duties, so it was decided to make the control semi-automatic. That is, the equipment would be started by pushing a button, but further operation would be automatic unless a short circuit on the alternating-current system or some other trouble of a similar nature shut down the machinery. The mine, served by these substations, is exceptionally dry and the air very dusty. For this reason, and to facilitate inspection, as much of the control equipment as possible was placed outside the mine. As finally planned, the only equipment that had to be installed inside the mines was: A 200-hp. alternating-current motor with control for a hoist, formerly driven by a direct-current motor; and two synchronous motor-generator sets with complete direct-current control but only one alternating-current control relay for each unit. All the other equipment for the motor-generator sets was to be installed in the outside control house.

That the power lines and control wires from the outside to the substations might be made as short as possible, the control house was located as directly over the substations as the surface conditions would permit. An 8-in. borehole was drilled to the 1,150-ft., or Red Ash, level and was so located as to cut the 650-ft., or Hillman, level in an opening in the coal. The hole was lined with a 6-in. casing pipe down to the solid rock. Through this hole the distance from the control house to each substation was about 2,500 ft. The station in the 650-ft. level was nearly 1,900 ft. from the place where the borehole cut through the bed.

Power is supplied through an outdoor transformer substation controlling a bank of three 200-kva. transformers. Here the voltage is reduced from 11,000 to 2,300 volts. The secondary wires run in conduit to the incoming line panel of the switchboard which is located in a brick control house erected adjacent to the transformer substation. Fig. 1 shows the general arrangement of the substation and control house and the headpiece the interior of the latter. The disconnecting switches of the incoming line are located well above the 2,300-volt busbars so that when they are opened there is little risk of accidental contact with any live parts. The switchboard panels are located on one side of the room, and the starting and running contactors for the motor-generator sets are along the opposite wall.

The switchboard arrangement is shown in Fig. 3. Starting at left, the panels are as follows: Alternating-current feeder panel (not shown); incoming line panel; control panel of No. 1, or Hillman bed, station; relay panel of No. 1 station; control panel of No. 2, or Red Ash bed, station; and relay panel of No. 2 station. The method of control of the mine substation was made as simple as possible, and, in the sequence of starting, each operation completes the circuit for the next following.

Speed acceleration of the two motor-generator sets is controlled by two timing relays. These may be distinguished readily in Fig. 3 as the small metal-covered devices on panels 3 and 5. They are set by experiment to have a slightly longer time delay than the machine which they control requires to reach synchronous speed. The other round metal-covered relay on the third panel is a delay relay, used after an alternating-current power failure, to delay the starting of No. 1 set until No. 2 is again on the line. The oil circuit breakers on the alternating-current substation feeders are set for about 300-per cent load. These open only in case of unusual trouble.

Protection against overloads is afforded by the direct-current breakers located inside the mines on the control panels of the motor-generator. The four large, round metal covered devices on the sub-bases of the panels shown in Fig. 3, are long-time thermal relays. These relays are not required for the usual mine load. The direct-current distributing system being sufficiently split up by several adequately protected feeders. A one-line diagram of the power system is shown in Fig. 7.

The machines can be started or stopped from three points, namely, the main shaft engine house, the control house and the inside station. The scheme of wiring is the familiar four-way electric-light control. To prevent unexpected starting from any of the other control points, the control buttons in the engine house at the shaft and in the inside stations are provided with normally closed contacts which can be locked in the open position. In the control house, this provision is not necessary, the double-pole double-throw control switch being left open when required.

The alternating-current feeders in the borehole consist of three-conductor 1/0 varnished cambric cables with 5,000-volt insulation and a double weatherproof braid over all. The Lehigh Valley Coal Co. has found

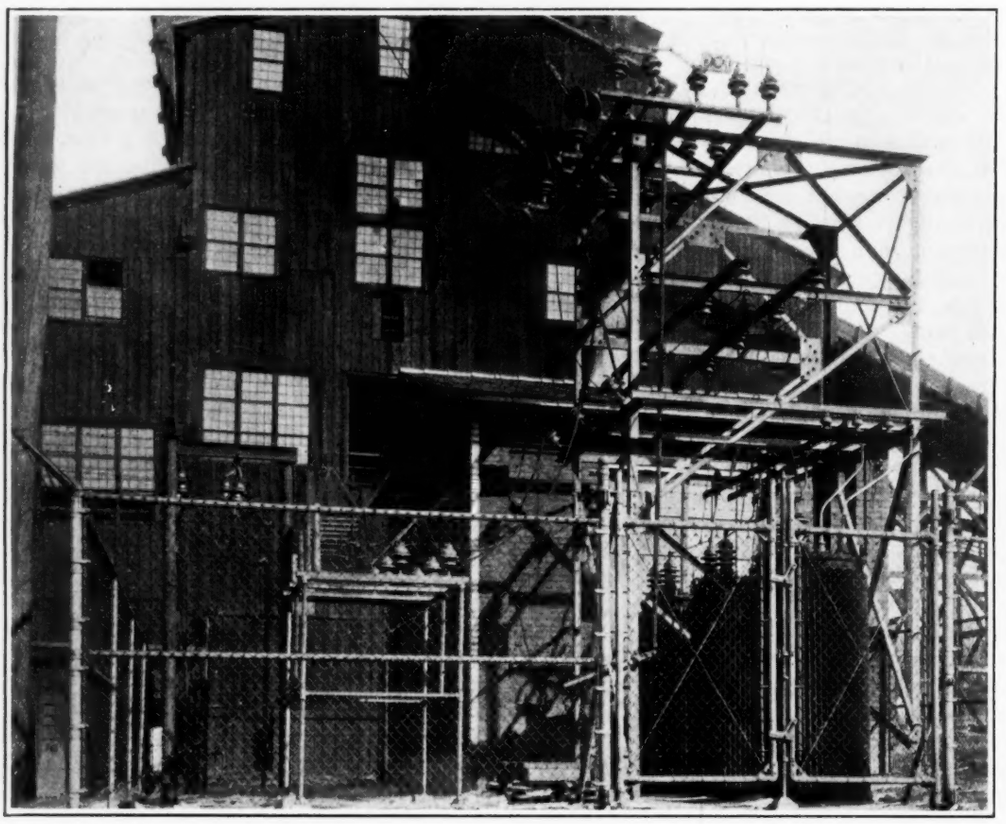


FIG. 1

Substation and Control House

Power is delivered to a bank of transformers located adjacent to the control house. Wires to the inside substations are suspended in the borehole. A wire fence encloses the high-voltage switching equipment and extends around the borehole structure and cable supports.

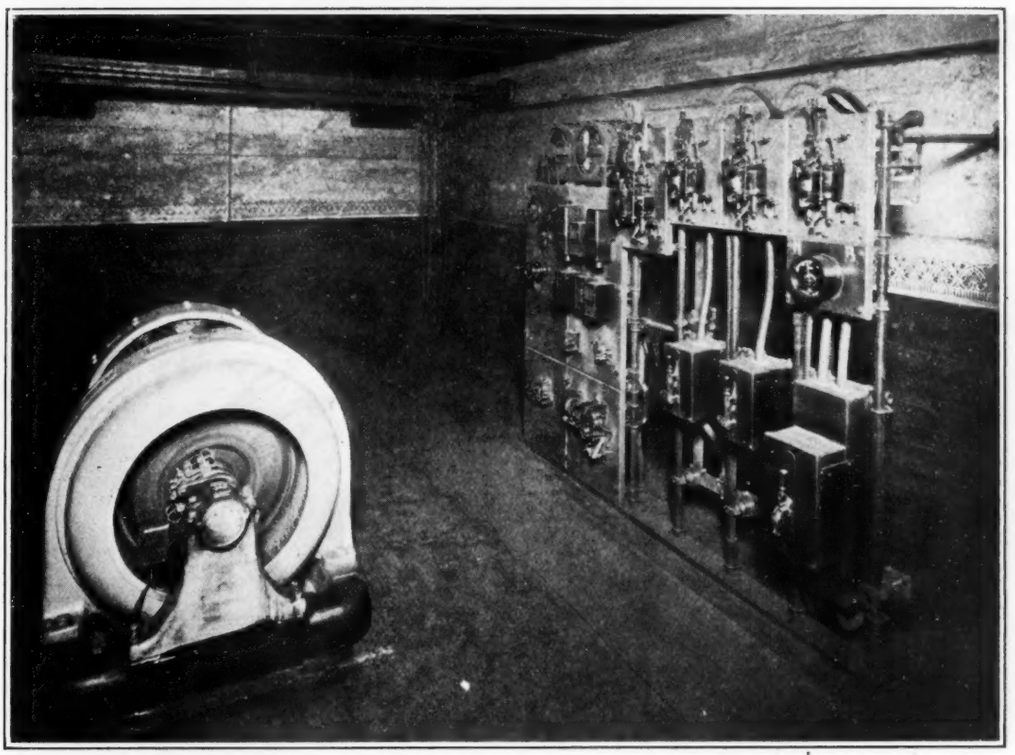


FIG. 2

Red Ash Bed Substation

Flexible conduit was used in many places. The wires pass through conduits with long-sweep bends. Most of the wiring is concealed and protected against dirt and moisture. Auxiliary relays on the main generator breaker trip out independent feeders before the load reaches a point necessitating the complete shut-down of the direct-current mining equipment.

that this type of cable gives excellent service in boreholes and that it does not need to be protected with lead covering, which would add greatly to its weight and make it more difficult to provide support. Where the tensile strength of the copper conductor is insufficient to support the weight, a steel armor is provided for suspension purposes. In this case the 1/0 conductor was of ample strength to sustain its 650-ft. of length, that being the distance to the first level.

The cable support is shown at the left in Fig. 1 between the frame of the lightning arrester and the fence. This was made of three 6-in. iron pipes 18 ft. long, set in concrete to form an equilateral triangle. The top of each pipe was fitted with a flange upon which was bolted an 8-in. 25-lb. I-beam. Under these beams was clamped one unit of a strain yoke. From each arm of the yoke was suspended two suspension-type insulators and a strain clamp. The cable was opened and each conductor fastened to one of these strain clamps. The yokes equalize the load of the cable upon the three conductors. This method of support has been used for the past seven years with no failures to date. At the 650-ft. level, eye bolts in the roof sustain the strain yokes to which are attached the feeders running to the 1,150-ft. level.

Before preparing to lower the cables, the exact cable lengths were obtained from the drillers' log and sufficient cable was stretched across the colliery yard The cable was then opened and a strain clamp fastened to each conductor.

Over the top of the hole, on wooden supports, was mounted a 4-ft. diameter sheave wheel with an especially large groove. One end of the cable was started over the sheave, and the clamps on the other end were fastened to a piece of ⅝-in. wire rope. Fortunately the colliery locomotive track was so located that it could be used for the lowering of the cable.

One end of the wire rope was attached to a 5-ton battery locomotive. Then the cable was lowered down the borehole by hand until its weight was sufficient to keep it moving, after which it was lowered by the locomotive, until just enough cable projected to fasten the clamps into the insulators of the yoke.

A split wooden clamp, about 15 in. long was clamped around cable and rested on top of the casing pipe. With the clamp in place the wire rope was removed and the strain clamps attached to the insulators, after which the wooden clamp was removed. The cables for the

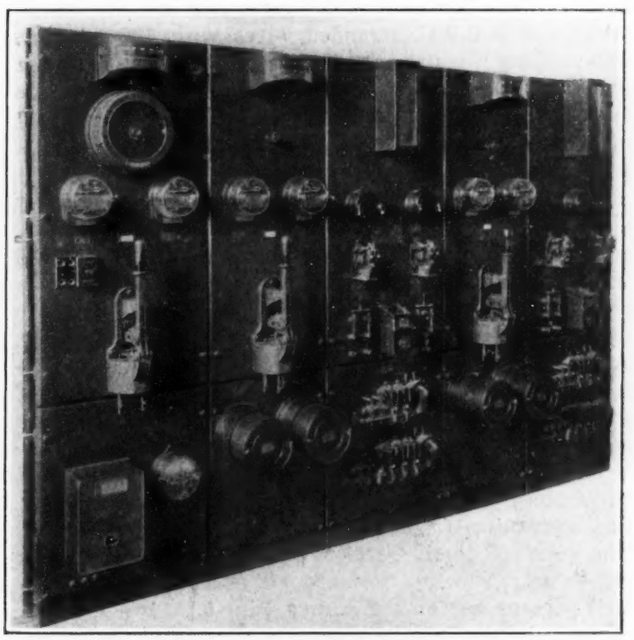


Fig. 3—View of Remote Control Apparatus For Two Automatic Substations

The apparatus mounted on and behind these panels controls the operation of each motor-generator set located in the mines. From left to right they are: incoming line panel; control panel for No. 1, Hillman bed, station; relay panel of No. 1 station; control panel for No. 2, Red Ash bed, station; and relay panel of No. 2 station.

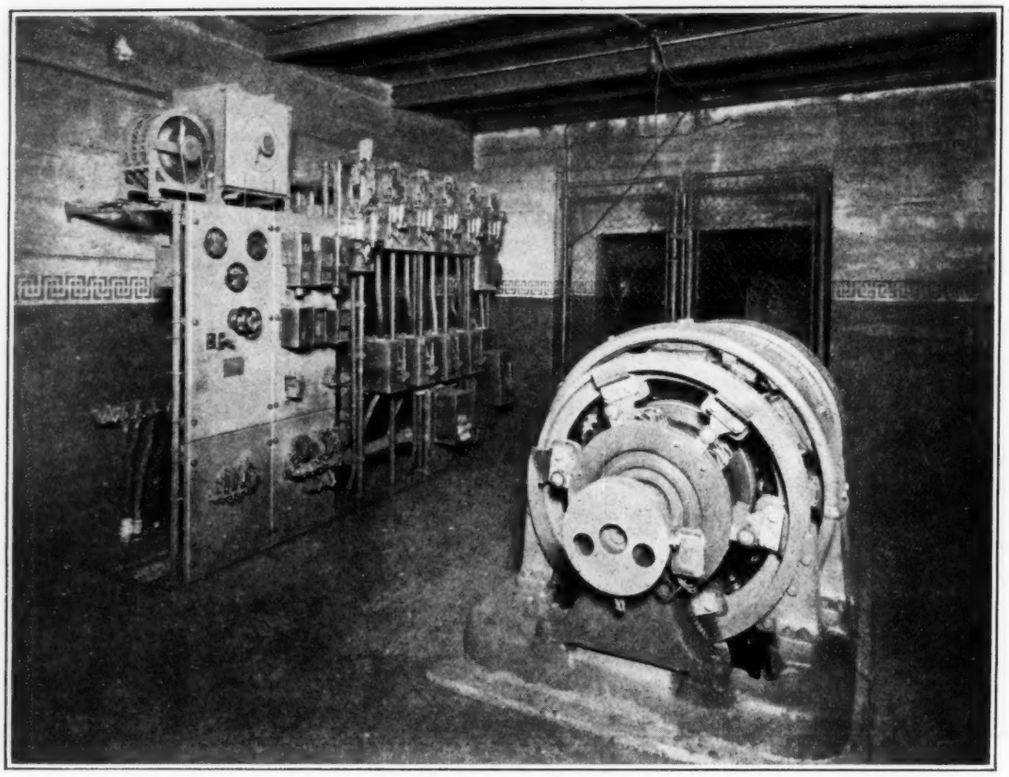


FIG. 4

Hillman Bed Substation

Both substation rooms are almost alike, each being made of concrete. A 3-ton hand-operated traveling crane is provided for moving any heavy parts of the motor - generator set. The entrance to the room is closed by a wire fence and gate thus the equipment is safe and no adjustments can be tampered with by an authorized person.

lower section of the borehole—between the 650- and 1,150-ft. levels—were installed first, the wire rope attached to the battery locomotive being long enough to reach from the surface to the 650-ft. level.

By this method the five pieces of cable were placed in the borehole with the assistance of only a few men and yet the cable while being lowered was at all times under full control. The station control wires, eight in number, four for each motor-generator set, are standard No. 6 D.B.R.C. stranded wires with 600-volt new code rubber insulation. These are dead-ended on a 6x6-in. wood cross-piece supported on iron brackets from the pipe poles. A telephone cable also forms part of the installation. This support can be seen in Fig. 1, just above the middle rail of the fence.

The interiors of the substation rooms are practically alike, except for the number of direct-current feeders, so that a description of the station on the 650-ft. level will suffice. A view looking toward the entrance is shown in Fig. 4. The room is 30 ft. long, 17 ft. wide and 10 ft. 6 in. high with concrete side walls and floor. A 3-ton hand-operated traveling crane forms a relatively inexpensive part of the equipment and is of great service in handling parts of the motor-generator sets during cleaning, inspection or repair.

Unfortunately these machines are so designed that the frames can not be slid off the base, for the motor and generator frames project below the base plate. The entrance to the station is closed by a double-wire screen gate, which is normally locked, to keep unauthorized persons out of the room. Fig. 5, shows the gate closed. In the vestibule outside the station is a pipe frame on which is mounted a non-automatic oil switch and a small panel. In the center of this panel can be seen the start and stop push buttons and the lockout button on the left.

The three knobs mounted above and below the push buttons are the control switches for each direct-current automatic breaker in the station. Thus, in case of emergency, any one can cut off any direct-current feeder by opening the proper control switch, or cut off the entire direct-current supply and shut down the machine by opening the oil switch. As all current-carrying parts are enclosed, these operations can be performed with perfect safety.

The automatic equipment in the station is mounted on the two 24x76-in. slate panels shown in Fig. 6. The panel on the left has a direct-current voltmeter with plug and receptacle, so that machine or feeder voltage can be read; a direct-current motor-field ammeter; a direct-current main ammeter; concentric hand wheels for field rheostats and a direct-current contactor on the sub-base. The latter controls the circuit breaker of the direct-current generator.

On the top of the other panel is mounted a direct-current voltage relay, which picks up when the direct-current voltage is 70 per cent of normal; a motor field relay which picks up when normal field current is established; a generator field-building relay which short-circuits a portion of the field rheostat, allowing the generator to build up its voltage quickly when started with the machine at normal operating temperature.

In the second row is a polarity relay, a direct-current relay, which disconnects the station in case the direct-current voltage coming from the other station is higher than the voltage of the generator in this station, and a reverse-power relay. This relay is not really necessary when there is only one set in the station, as the direct-current relay just mentioned makes provision against power reversal. The next row has a contactor for the reverse-power relay and an alternating-current contactor forming an interlock between the alternating- and direct-current control circuits. On the switchboard sub-base is a motor-field contactor.

To the right of the slate panels are the direct-

current feeder controls consisting of reclosing circuit breakers and safety-type disconnecting knife switches. The first breaker is in the generator lead, and its overload trip setting is about 225 per cent of the full load on the generator. The next several breakers control direct-current feeders, the one on the extreme right controlling a tie feeder between the two converting stations.

The oil switch located outside the substation is provided with a shunt trip coil and a circuit-opening switch. The former is energized through machine-bearing thermostats or, in case of field failure, by a motor field relay. The circuit-opening switch opens the main control circuit thus dropping out the running contactor in the control house, making a complete restart necessary. This prevents closing the oil switch with full voltage on the supply leads to the motor.

Each machine was placed as near as possible to the center of load on its particular level and, to take advantage of the diversity factor, a feeder was installed to tie the two direct-current station buses together. The generator breaker was set to trip at a rather high overload, so that it would act only under excessive load. This was done to prevent the high starting current taken by locomotives from opening the breaker too frequently after a complete interruption of direct-current power.

To take further care of this condition, two overload relays were installed in the generator lead each with its auxiliary contact in series with the operating coil of one of the feeder breakers. The overload setting of one relay was about 10 per cent and the other 20 per cent below the setting of the generator breaker. When peaks combine on the main breaker, one overload relay opens its contacts and trips out the feeder breaker to which it is connected. If the load continues to increase, the other relay trips out its feeder. This usually reduces the station load to a safe value. As the load falls off, one relay and then the other drops and recloses the respective breakers. This arrangement, by preventing the generator breaker opening repeatedly on peak loads, has prevented much lost time.

Figs. 5 and 8, showing the two substations give a better idea of the outside control features, the gates and the arrangement of the direct-current circuit breakers. The light streaks on each device are metal name plates, showing the purpose of each switch or push button. The direct-current feeders are run in conduits placed in the side wall of the room, so that the station is remarkably free from visible wiring. The ammeter in Fig. 2 shows that at the time the picture was taken No. 2 station generator was delivering 300 amp. over the tie feeder to No. 1 station bus.

As the greater part of the total mine load was near No. 1 station it was planned at first to have the generator in No. 1 station flat-compounded and the generator in No. 2 station over-compounded. It was hoped that by this arrangement energy could be supplied to busbars of No. 1 station from No. 2 station; the overcompounding of the one generator being sufficient to make up for the voltage drop through the tie feeder.

A few weeks of operation demonstrated that this would not give the result desired, as a heavy load on No. 2 station when No. 1 station was lightly loaded would raise the potential of the tie feeder, due to compounding of No. 2 station generator, sufficiently to force No. 1 station generator off the bus by the functioning of the reverse-power relay. A heavy demand for power near No. 1 station would then trip the main breaker at No. 2 station.

After experimenting a while it was found that each machine must be given a slightly drooping characteristic, in order to get the desired results from the tie feeder. The reverse-power relay was disconnected from

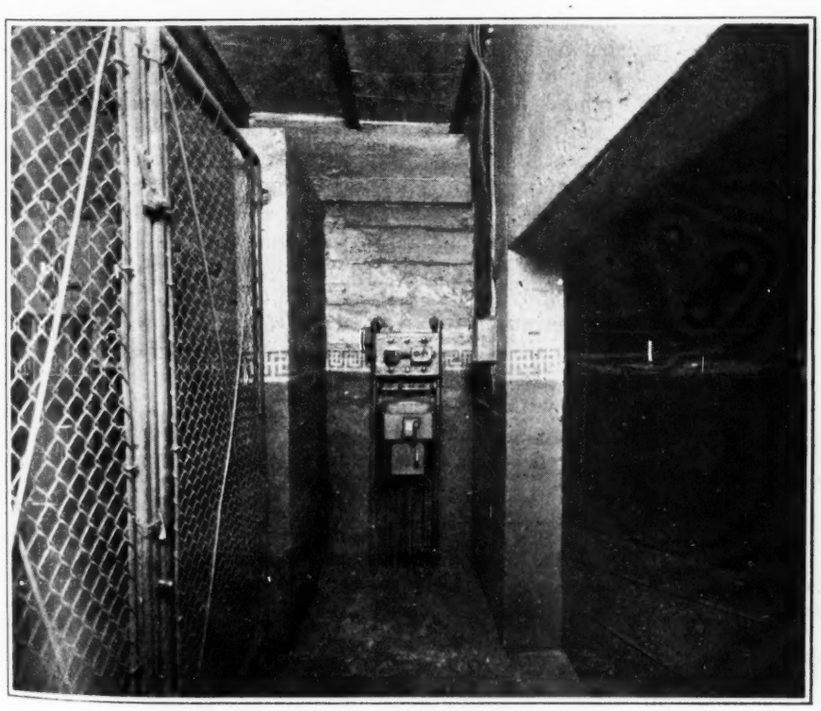


Fig. 5—Motor-Generator Set Stopped from Ante-Room

The oil switch located outside of the substation may be used to stop the motor-generator set in case of emergency. Each direct-current feeder circuit may be closed or opened by means of the control switches located on the slate panel above the oil switch.

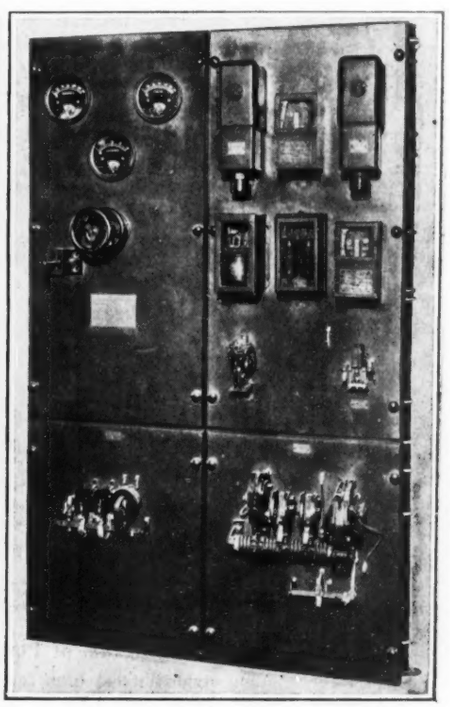


Fig. 6—Instrument and Relay Panels

These two panels are located inside the mine with the motor-generator set. All other starting and control apparatus is located in the outside control house.

Table I—Equipment Driven by Power from Motor-Generator Sets

Twenty-one 8-ton locomotives totaling	1,596 hp.
One 13-ton locomotive	134 hp.
Two hoists totaling	90 hp.
Four pumps totaling	65 hp.
One box-car loader	15 hp.
One empty-car haul	15 hp.
Lighting	5 hp.
Total direct-current equipment	1,920 hp.

the generator breaker and connected so as to control the tie feeder breaker at No. 1 station. This allowed No. 1 station generator always to be connected to its station bus ready for any power demands that might be made.

After several months operation of the equipment, it was found desirable to have some means of indicating at the control station in the engine house at the shaft when each station was in operation. As there was an extra circuit-closing contact on each running contactor of the motor-generator sets, two wires were run between the control house and the engine house at the shaft and connected to lamps enclosed in red globes. With the closing of either of the two running contactors the respective lamp is lighted, giving the necessary indication.

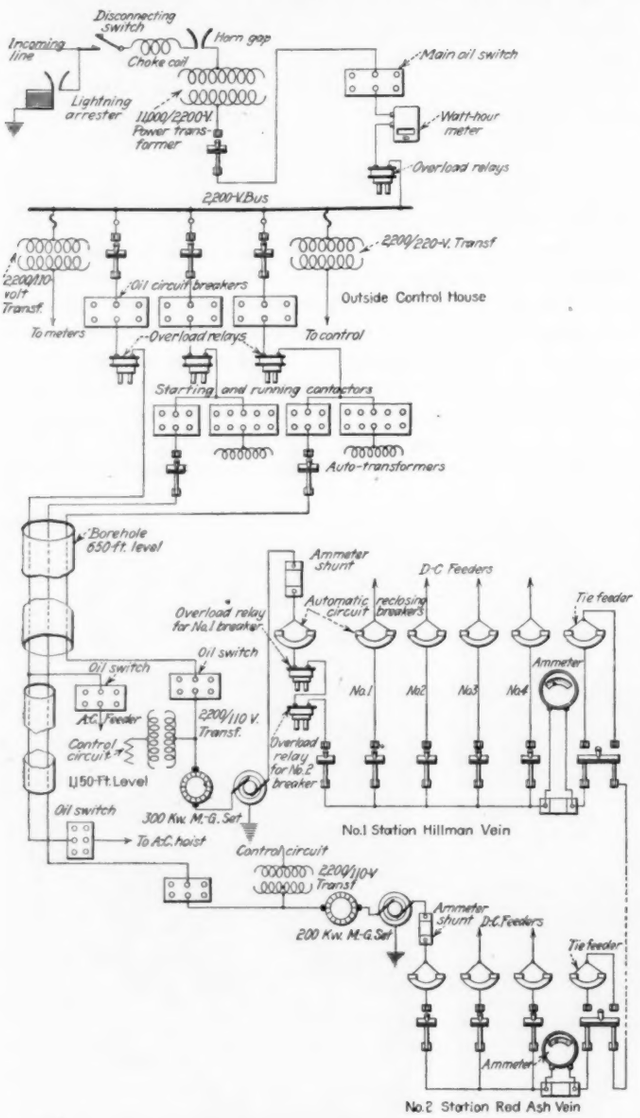


Fig. 7—One-Line Diagram of Power System

The power system divides itself into four parts; the power transformers, control house and two inside substations. Only 2,300-volt energy goes into the control house. There it is distributed to an alternating-current motor-driven hoist and the Hillman and Red Ash bed substations. The direct-current system is split up into many feeders, each controlled by automatic reclosing circuit breakers. A tie feeder connects the two substations and at night one motor-generator set supplies power to all the feeders in both stations.

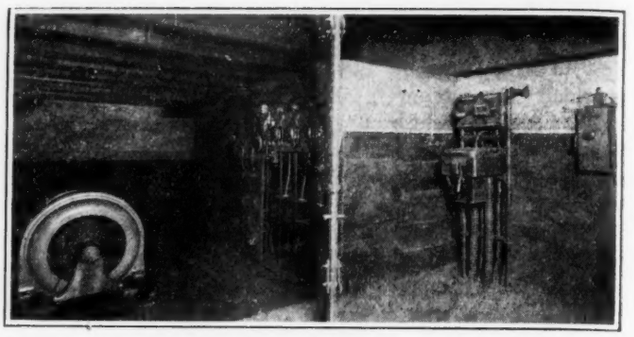


Fig. 8—Control Buttons Outside of Red Ash Bed Substation

The general view of the substation shows how everything has been arranged to make inspection and repair work as simple and easy as possible. Each direct-current circuit is provided with a disconnecting switch enclosed in a steel cabinet.

The equipment in Table I is furnished with direct-current power from the motor-generator sets.

The figures in Table II show that a large diversity factor may be expected when the number of locomotives supplied with energy is relatively large.

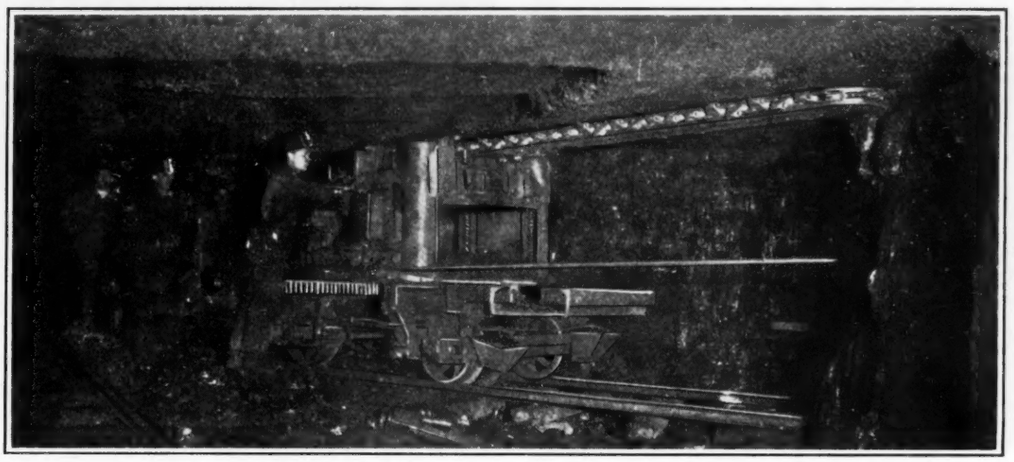
The locomotives at this mine are used mainly for gathering and they make relatively short hauls to the main haulage roads. However, many of the chambers pitch steeply, at gradients varying from 8 to 18 per cent. This explains the small number of main-haulage locomotives.

Before the voltage regulation of the two generators had been satisfactorily adjusted, so that a reasonable amount of direct-current power could be interchanged between the two substations over the tie feeder, and before the installation of the direct-current overload relays in the generator lead of No. 1 substation, the monthly 15-minute maximum demand for the entire operation was as high as 634 kw. In addition to the foregoing improvements, automotoneers were installed on most of the locomotives, and some changes were made in the method of handling trips. The maximum demand then dropped to 525 kw. but has since increased gradually to about an average of 575 kw.

The automatic substations have been in service for 18 months. The delays, directly due to failure, have been few and of such short duration as not to interfere with the output of coal. In fact it has been my experience that such minor delays need not be considered when automatic substation equipment is proposed.

Table II—Capacities, Loads and Power Demand of Machinery at Dorrance Colliery

Total capacity of motor generator	500 kw.
Connected load per kw. of generator capacity	3.84 hp.
Assuming 80 per cent average efficiency of motor-generator set the equivalent connected load to alternating-current side is	2,400 hp.
One alternating-current hoist	250-hp.
Total alternating-current connected load at mine	2,650 hp.
Capacity of transformer bank	600 kva.
Connected load per kva. of transformer capacity	4.4 hp.
Average monthly power consumption	105,000 kw.-hr.
Average monthly maximum 15-minute demand	575 kw.
Kilowatt demand per horsepower of connected load	0.22 kw.



Turning a Room with Straight-Face Machine

Utah Company Uses Top Cutting Successfully

Cutter Bar Bent to Avoid Loss of Height—Top Cutter Saves Its Cost in Timber, and Coal Lost in Roof Is Compensated in Coal Saved in Drawing Pillars—Suited Only to Thick Coal

By Thomas A. Stroup
Mine Superintendent, Utah Fuel Co., Clear Creek, Utah

SINCE 1915, the Utah Fuel Co., has had three straight-face mining machines in constant use at its Clear Creek property. During this time many data on the operation of such machines and on the application of top cutting to coal mines in general have been accumulated.

Wherever the physical conditions encountered are suitable, top cutting is a highly advantageous method of mining because of the ease of operation, the appreciable economy in labor and the great capacity obtained from a single machine. Under unfavorable conditions, however, this method is troublesome and wasteful. Mines adaptable to top cutting are, however, not uncommon, and this mode of mining deserves a much wider application than it now has. For several reasons, the idea of top cutting has always appealed to mining men. When it is used the roof rock is protected by the top coal and is not shattered in shooting. The method promises great economy in the use of timber as well as increased safety in mining. It has always seemed obvious that a coal-cutting machine that remains on the track while in operation would be highly advantageous. Furthermore, a machine with an adjustable height of cutter bar would certainly be of use in cutting shale and bony bands from the coal, thus insuring a clean product. These, in short, are the chief reasons for interest in top cutters.

In general, top-cutting machines have been developed along two separate lines, and at present are of two fairly distinct types. The arcwall machine is representative of one variety. This cuts by a swinging motion of the cutter bar about the axis of the machine. It consequently makes a cut in the form of a circular segment. The Oldroyd machine, which has been developed more recently, makes a cut of the same general characteristics. It is believed by many engineers that a cut of this nature is tight on the ribs and difficult to shoot. There is unquestionably some foundation for this view, but the difficulties encountered have doubtless been overestimated.

A second type of machine designed to secure a square face in the room or entry being worked and one exactly similar in shape to that produced by an ordinary undercutter has also been developed. This is known as the straightface overcutter and was designed to overcome the objections incident to the circular cut. At the expense of a somewhat more complicated mechanism

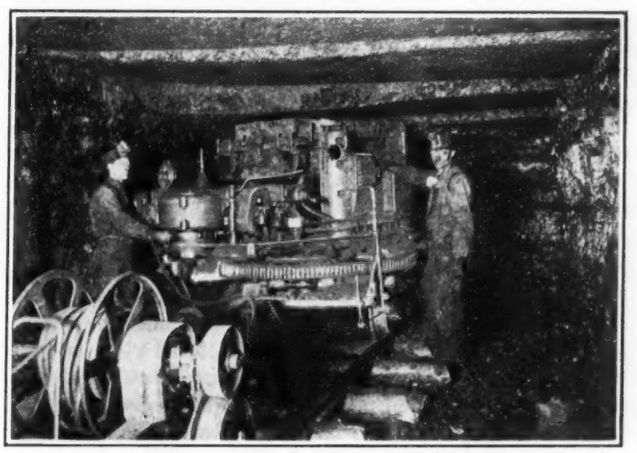
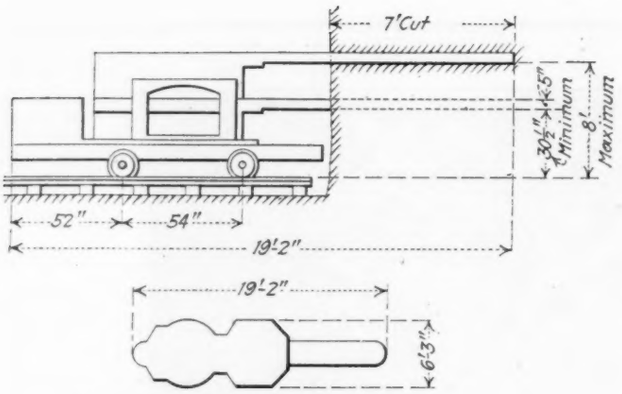


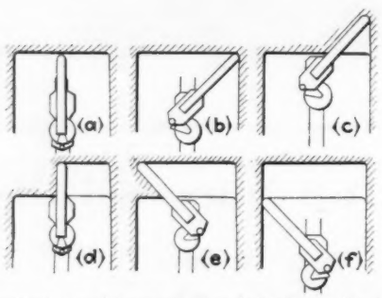
Fig. 1—Straight-Face Cutter at Work in a Room

The tendency of the cutterbar to crowd up or down may be seen by contrasting the offsets in the roof. Apparently this tendency can never be entirely avoided.

Article entitled "Use of Overcutting Machines" read at February meeting of Rocky Mountain Coal Mining Institute. Illustrations by courtesy of Goodman Manufacturing Co.



Clearance Diagram of Straight-Face Machine as used at Clear Creek



Operating Positions of Straight-Face Machine

Fig. 2—Operation and Clearance of Straight-Face Machine

By utilizing a cam cut in the base plate of the machine the cutter is constrained to excavate a square place instead of one that is semi-circular thus enabling the coal to shear on the lines of cleat.

than that employed in the arcwall, this machine gives a straight cut across the face and one that lends itself admirably to present-day shooting methods.

Top cutters cannot be advantageously introduced into all coal beds. Measures less than 6 ft. thick are little adapted to them, unless the problem encountered is that of cutting out a bone or clay band, and then removing the coal from both above and below it. In ordinary top cutting from 6 to 12 in. of coal must be left in place, in order to avoid cutting into the roof rock, also to provide the necessary cutting angle so that the place will not tend to lose height, as will be explained later. The ideal thickness of a coal bed for the use of an overcutter is 7 ft. or more. With straight-face machines the coal is cut preferably from 6½ to 7½ ft. above the rail. Hard shale bands cannot be removed with these machines, as well as they can with the ordinary shortwall machine, for the driving mechanism and cutter bar form a more rigid unit. The cutter will be deflected into the more reaidly cut coal.

At Clear Creek, a band of hard dark shale from 1 to 3 in. thick occurs about 18 in. below the top of the 8-ft. bed. This parting is persistent and extends all over the mine. Repeated attempts have been made to cut it out, but all have failed. At low feed the machines have ample power for the work, but the deflection of the cutter bar cannot be controlled. So great is the force of this deflection that in extreme cases the entire machine, weighing 7 tons, has been lifted clear of the rails, or, in the case of downward pressure, the rails have broken under the machine. Pressures of this magnitude may occur in shortwall work also, but they are not serious as the weight of the machine is appreciably less and its movement is virtually unrestricted.

Top cutters must not be expected to remove bands of impurities that are appreciably harder than the rest of the coal bed. The presence of irregular masses or lenses of hard material also is fatal to the work of the top cutter. For best results, the coal must be uniform in texture, and impurities, if they occur, must lie in regular bands that can be avoided in cutting.

Top cutters create more dust than shortwall machines, for the bugdust must fall further to reach the floor. Application of water to the cutter bar, which is entirely practical with the shortwall machine, is a failure with top cutters. The cutter bar being located above the electrical driving unit, any water that may be applied will find its way to the motors and controllers. Of course, dust on the floor and at the face may be kept wet, but that made by the machine during the cutting process cannot well be controlled. In mines where the dust is particularly flammable, it would be well to avoid the use of top-cutting machines.

For the successful operation of top cutters the coal should part readily from the floor. At the bottom of some coal measures occurs a layer of impurities which may be "frozen" to the rock floor. In shortwall cutting, it is obvious that the cutter bar will work above these impurities. In top cutting, however, they are liable to be lifted from the floor in shooting and have to be sorted out of the coal. If the lower strata, where the impurities or clean coal are "frozen" to the bottom, the shoveling surface is rough and the efficiency of the loaders is greatly reduced.

An ideal bed for the use of a top-cutting machine is one that is free from impurities at the bottom and which breaks free from the footwall, leaving a smooth floor on which to shovel. This is the condition at Clear Creek and it has contributed in on small measure to the success of top cutting.

The character of the roof determines how much timbering is needed and so is also a potent factor in top cutting. As the machine swings horizontally from a fixed center above the track, it requires more room than an undercutting machine. In all cases, it is advisable to keep the timbers at least 21 ft. from the face. A row of props, however, may be set if required 4 ft. from the rail upon either side to within 14 ft. of the face. If the roof breaks up to the face, it will be necessary to break down the top coal and cross timber the place at a sufficient height to clear the machine. One great advantage of top cutting, however, is that a small layer of coal may be left undisturbed to protect the roof. Nevertheless with extremely bad roof this slab of coal in itself is liable to be dangerous. Under such roofs top cutting should be avoided.

Such machines as are used at Clear Creek obtain their straight-face motion from a cam cut into the base plate of the machine, upon which the entire mechanism moves. This renders the method of sumping the machine and withdrawing it from the cut somewhat unusual. In practice, the machine is run up to the face, the cutter bar swung to the corner where cutting is to start, which, at Clear Creek, is the right-hand side of the room. The miner in preparing his place has drilled a sump hole 18 in. deep 3 ft. off the floor and 18 in. to the right of the center line of the place. Into it the sump hook is driven as shown in detail in Fig. 3.

The machine is now started and pulled into the cut by a rope extending from the hook to a drum on the rear of the machine. When the latter has been pulled forward to such a point that the base plate touches the

face of the coal, the live drum is disengaged and the machine blocked in place for making the cut. This blocking is necessary for by it the machine is held in place despite the stresses encountered during cutting. It consists of props or ties placed against the ribs and against the frame or wheels of the machine itself. Even with these precautions, the operator of the cutter must be constantly on the alert to see that the machine is not lifted from the track, or the track pushed to one side by the heavy forces acting upon it. A device for raising and lowering the cutting mechanism either by hand or power is provided to relieve the strain should this happen.

After the sump rope has been cast off the machine makes its cross cut by being simply traversed on the cam by means of a pinion working on a quadrant on the base plate. The path described by the end of the cutter bar is a straight line which may vary in length up to 18 ft., depending on the starting and stopping positions of the machine on the cam. The cutter is withdrawn from its cut by means of a rope and jack pipe using the live drum again as a means of propulsion. This entire cycle of operation can be completed in an 18-ft. place in from ten to fifteen min.

All top cutters require good track. At Clear Creek, 30-lb. rails are standard, these being laid on 5x5-in. pine ties. In the past, however, some 20-lb. rails were used. By careful attention to laying, close spacing of ties and the proper fish-plating of all joints, 20-lb. rails may be successfully used. They are not, however, recommended. The track must be extended clear up to the face for each cut. For this purpose, pieces of rails from 6 to 7 ft. long are provided.

The track must be blocked up till it is approximately level and must, of course, be brought to gage and cross-leveled. It is also necessary to brace it against the ribs upon either side, so as to prevent the machine from pushing it over while cutting. The work is continuously advanced by laying the short pieces of rail above mentioned, but whenever a sufficient distance has been gained, these short pieces are lifted and a full length of rail laid. At the present time, the miners at Clear Creek are laying their own track. This work requires about one hour per cut, or per day.

When the top cutters were first introduced into these mines much difficulty was experienced for the places tended to lose height. An exhaustive inquiry into the cause and possible remedy for this condition was made, as it was understood that this was a common fault with machines of this kind and a detriment to their continued operation. As little assistance could be obtained from outside sources, the entire problem had to be solved locally.

It became evident from the outset that the roof would consist of a series of offsets and angle cuts, the front end of each cut being higher than the rear end. The

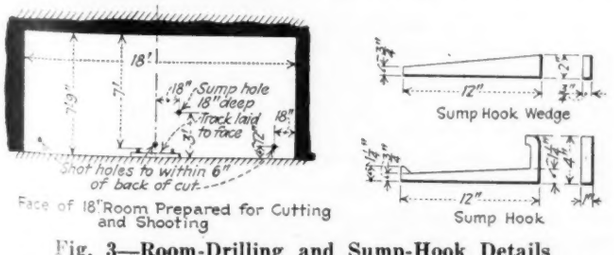
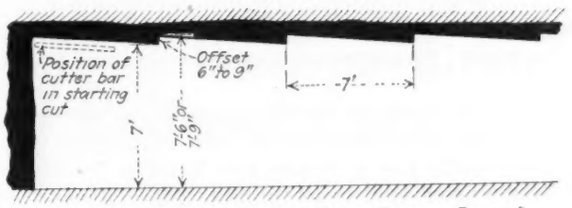
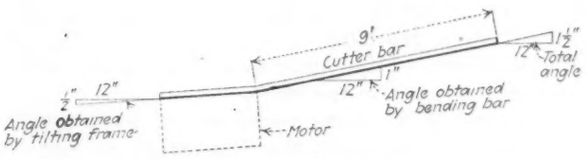


Fig. 3—Room-Drilling and Sump-Hook Details

Three shot holes which lack 6 in. of being as deep as the top cut and one sump hole usually about 18 in. deep are all the holes it is necessary to drill in the room face.



Longitudinal Section of Room Showing Proper Sequence of Cuts for Best Work



Sketch of Cutter Bar Angles

Fig. 4—Angle and Cut Made by Cutter Bar

Although the bar was tilted upward at an angle equal to ½ in. per foot, this was not enough and it was given a bend of 1 in. per foot. This gives the bar a total upward inclination of 15 in. and to the portion of the bar engaged in cutting a rise of 10½ in.

builders of the machine had provided a slight adjustment on the front trucks by means of which the entire front of the machine could be raised until the nose of the cutter bar was about 6 in. above the horizontal, the bar thus making an angle with the track. It was soon found that this was far too slight an inclination and after much experimenting with methods of blocking up the front end of the machine, it was decided to try bending the cutter bar itself. This was done and it solved the problem completely, the coal now being cut continuously without recourse to brushing, which was a common and troublesome expedient for overcoming lost height before the bar was bent.

In practice, the cutter bars are heated and bent just forward at the clamp that binds them to the motor housing. The extending portion of the bar thus makes an angle with the portion clamped to the frame, this inclination being 1 in. per ft. The free portion of the bar is 9 ft. long, in order to obtain a cut 7 ft. in depth. Through the adjustment on the frame of the machine already mentioned an inclination to the horizontal of ½ in. to the foot can be obtained, so that the total inclination of the bar is 1½ in. per ft. This gives an offset or inclination of 10½ in. in a cut 7 ft. deep. In making the cut, however, the bar almost invariably bears downward at the point, and the usual offset in the roof is from 6 to 9 in.

Fig. 4 shows in detail the roof offsets and angles made, as well as the alterations in the cutter bar found necessary to bring the machine to its highest efficiency. No difficulty has been encountered in making the chain follow the slight vertical bend in the cutter bar. Everything considered, therefore, the problem of losing height has been satisfactorily solved.

The cutter bars on these machines are built in a somewhat peculiar manner. A heavy T-rail is planed down to the width of the chain and hard steel guides riveted to it. Some trouble has been experienced from the breaking of these rails. It has been found feasible, however, to torch-weld the broken rail so that the expense is not as great as in the past. For the three machines employed at these mines, two spare cutter bars are kept ready in case of a breakdown of this character, or in case a bar is bent down to such an extent as would cause a probable loss of height. These

bars are bent to the proper angle before being sent into the mine. Two men can change one in about two hours.

The crew necessary to operate one of these machines consists of two men; an operator who controls all machine movements and a helper who handles the sump rope, brake, cable and makes himself generally useful. At these mines the men work on a tonnage basis, the rate being 10.3c. and the division of proceeds being 55 per cent to the runner and 45 per cent to the helper. As many as fifteen to sixteen places may be cut per shift if little traveling is involved and no operating trouble arises. From nine to eleven places, however, ordinarily are cut in one shift.

The average of power consumption is 43 hp. for a 6 ft. 9 in. cut with sharp bits. Readings for individual cuts have run as low as 35 hp. and as high as 48 hp. Power consumption should not vary appreciably from mine to mine.

Two men can change a set of bits in 15 min. The bits used at Clear Creek are of ordinary carbon steel tempered in black oil. Seldom will a set of bits (64 in number on the present machine) cut more than two places, and one place to a set is more common. It thus may be seen that the time consumed in changing bits approximates that employed in actually cutting the coal.

The possibility of using alloyed and self-hardening steel bits is deserving of study, as the wastes existing at present are obvious to anyone. The fact that the most glaring inefficiencies are covered by the contract wage does not decrease their seriousness. In fact the most grievous inefficiencies and the most costly ones encountered in present-day coal mining are found in contract work and are not the result of official organization or of day labor. One of the coal industry's most pressing problems is to correct these evils and to obtain cheaper coal as its portion of the benefits arising from their correction.

As has been mentioned, the saving in timber is an appreciable item in favor of top-cutting machines. In coal 7 to 8 ft. high with only a fairly good roof, such as that at Clear Creek, this saving is appreciable. It can only be estimated, of course, but it is believed that the original cost of the machine is saved every three years in timber alone, without any consideration being given to the labor required in setting it. The system of timbering employed in a top-cut room is shown in Fig. 5. Only props are used and many of these are ultimately recovered.

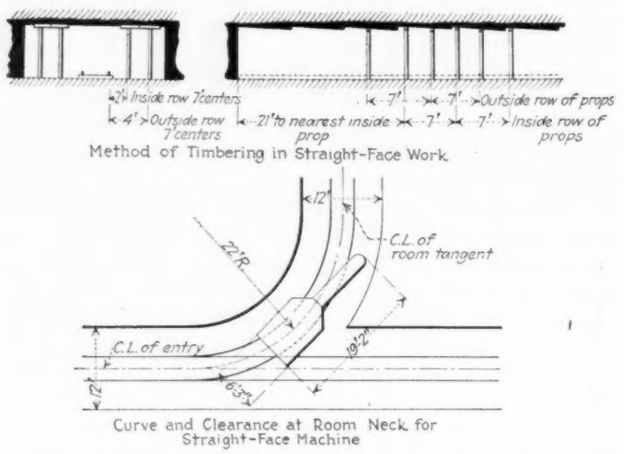


Fig. 5—Clearances and Method of Timbering

The machine being long, it is necessary to give the room mouth an easy curvature, the rail being laid on a 22-ft. radius. As the machine must cut with a sweep, the nearest inside prop must be 21 ft. from the face.

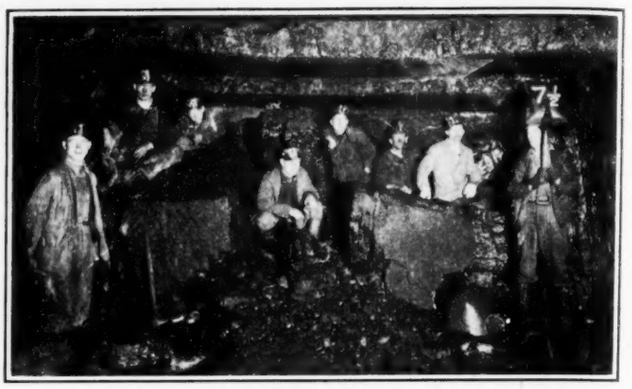


Fig. 6—What a Straight-Face Machine Cut Looks Like When Shot

From this picture the large percentage of lump attained by the use of the overcutter may be readily imagined from the size of the pieces shown in the illustration. Of course such pieces as these must be broken down with a pick before they can be loaded.

Even a small layer of top coal constitutes an effective bridge between the ribs of the place. This largely prevents the ribs from scaling and keeps the pillars in good shape while they are being drawn. Obviously when top coal is thin, none of it is recovered, but the increased recovery from the pillars usually far more than counterbalances this loss. Pillars in top-cutting mines always are drawn with less loss of coal and less expenditure for timbers than in those where shortwall machines are being used. In some measures this is because where top cutters are used the roof is not affected by shooting. It largely results also from the leaving of a coal bridge between the ribs.

The maintenance of top-cutting machines is relatively costly. The average cost at Clear Creek during the past three years has been 9.1c. per ton, exclusive of bits, which cost 1.8c. for replacement and for the labor of sharpening. Oil and grease cost 0.22c. per ton.

Top cutters present also certain advantages in pillar drawing where the end-cutting system is in use. The track can be laid close to the face, the clearance essential for the shortwall machine being unnecessary. The first row of timbers can be set close to the track. The roof break can thus be maintained closer to the face and greater safety and efficiency in operation secured. This method is being tried at Clear Creek, but it is as yet too early to publish details of actual operation.

The future of the top cutter is by no means certain. The introduction of loading machines will change cutting practice greatly. Under present circumstances, and probably in most machine mining, the top cutter should be preferred wherever physical conditions favor its use. For slabbing longwall faces in high coal and in end-cutting pillars this machine has certain advantages. But the perfection of loading machines and the consequent demand for large tonnage per place will probably lead to the development of super-cutters of the shortwall type. It seems possible to assume that cuts up to a depth of 12 ft. can be successfully made and shot, cuts 9 ft. deep having been repeatedly made and brought down without difficulty. That such long cutter bars, however, will be practical on top-cutting machines is open to doubt and beyond question the entire future of cutting is inseparably bound up with the future of machine loading.

Anti-Friction Bearings Lower Transportation Costs from Face to Railroad Car

Need Only One-Fourth as Many Applications of Lubricant as Plain Bearings and Have Nearly Twice as Long a Life—Lubrication Cost Reduced by Two-Thirds—Save Power and Equipment

By Frank H. Kneeland
Associate Editor, *Coal Age*
New York City

WHEN the cave man, attempting to move a load greater than he could lift, became weary of dragging it over the ground and tried the expedient of placing lengths of logs transversely under it and thus rolling it along, he learned an important lesson, namely, that the co-efficient of rolling friction is not rearly as great as that of sliding friction. Of course the primitive individual making this discovery did not realize what he had discovered. Of coefficients of all kinds he knew nothing and probably cared less. What interested him and what he remembered and taught his progeny was that any weight can be moved with far less effort when placed on rollers than when dragged over the ground.

Down through the ages this discovery of the cave man has been utilized. For permanent work, that is, for installation upon vehicles, a wheel turning on an axle fastened to the body of the device to be moved soon took the place of the crude roller. This combined both rolling and sliding friction—rolling on the ground and sliding on the axle. As, however, the area of sliding friction was small and susceptible to lubrication, the shortcomings of rubbing friction were largely overcome. Even the ponderous creaking ox cart still used largely in tropical America and elsewhere is a vast improvement over the drag or stoneboat.

Bicycle Develops Anti-Friction Bearing

Unquestionably the wheel, whether turning upon or fastened to an axle, which itself turns in a bearing, has been responsible for much of the progress man has made thus far on the road of civilization. It has remained for comparatively recent times, however, to perfect a device whereby the sliding friction of the wheel upon the axletree, or of the axle within its bearing or journal, is replaced with rolling friction. Here rollers or balls are inserted between the inner surface of the moving wheel hub and the stationary axle, or between the revolving shaft and its stationary bearing. This arrangement entirely obviates sliding friction, and journals that accomplish this result regardless of their size, kind or type are known and designated under the general name of anti-friction bearings.

Generally speaking, anti-friction bearings are of two types, namely, roller and ball bearings. Both have been used extensively in industrial work and have become familiar to everyone, particularly since the invention of the bicycle and the later development of the automobile. In recent years these bearings have been applied freely in mine transportation. As the roller was probably known and used in industry long before the ball, the bearings employing this element will be considered first.

Because of its shape a right cylinder will roll without slippage only in a direction at right angles to its axis. Any end movement of the roller is resisted by sliding friction, but its side movement is resisted only by rolling friction.

In its simplest form a roller bearing consists, as in prehistoric times, of a roller, the surface over which it operates and the body resting upon it. In this case the supporting surface, if straight, forms a raceway of infinite radius, whereas the weight carried, provided it be a beam or other object presenting a plane surface, corresponds to the shaft of a modern bearing, also having an infinite radius.

Industrially the roller bearing of the simplest type is composed of a raceway within a wheel if the shaft is stationary, or within a pillow block or bearing if the shaft revolves, together with a sufficient number of rollers to prevent contact between shaft and bearing or between shaft and wheel as the case may be. The harder and smoother all of these parts are made the less will be the resistance offered to rotation.

No matter how carefully and accurately the various parts making up such a bearing as has just been described may be machined, hardened and ground, dirt must be excluded and the rollers held in their proper positions if maximum efficiency is to be attained. Without these provisions such a bearing is difficult to handle, the rollers have a marked tendency to slip out of place and must be put in position one at a time. Furthermore, being put into place individually with nothing to hold them apart they grind against each other, this action being aggravated by any slight differences in diameter which rollers, be they ground ever so carefully, are nevertheless certain to possess.

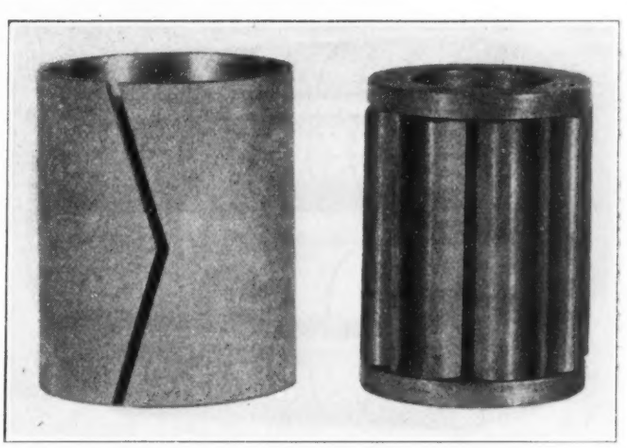


Fig 1—Cage with Rollers and Race

Solid rollers ground to size are provided with a gudgeon on either end. These gudgeons fit loosely into holes in the end rings which are held apart by four spacers or spacing rods. The race is a strap of steel bent to proper diameter, hardened and ground inside. The V-shaped joint makes the operation of the rollers easy and smooth.

As is well known, dirt in any bearing rapidly destroys it. This is particularly true of those anti-friction types where efficiency depends largely upon nicety of adjustment. Thus in the type of bearing just described dirt entering the raceway from the end or elsewhere, impedes the free rotation of the rollers, and finding its way between these members and either the shaft or raceway, is crushed or ground between these parts just as ore or shale is ground in a Chilean mill. In time such particles uniting with the oil used for journal lubrication forms an abrasive mud, which, accumulating as time goes on, gradually fills the entire space between the rollers.

On the other hand, if the particles of foreign matter entering a bearing of this kind are sufficiently hard to resist crushing, they become embedded in the steel of the bearing and then not only destroy the smooth surface of the parts but exert an abrasive action exactly analogous to that of a diamond truer on an emery wheel. Although this action is possibly slight for each individual particle, its effect on the aggregate wear and resistance is important.

As a rule the actions spoken of above, abrasion and gumming, take place simultaneously. Sometimes the gumming action becomes so pronounced and the bearings become so "stogged" or clogged with mud that the rollers cease to revolve. When such bearings have operated for a comparatively short time measurements of the rollers as well as of the shafts will show noticeable wear. In extreme instances each roller will become so worn that its cross-section almost resembles a crescent.

Function Well Only When Dirt Is Excluded

Rollers or balls that do not roll are worse than useless, as they defeat the very object they are designed to accomplish. consequently, dirt and all other matter except lubricant must be excluded from all anti-friction bearings if they are to function correctly and retain their efficiency for any length of time. Dirt is excluded usually by a felt washer. That this means is effective is evidenced by its almost universal use in the anti-friction bearings of automobiles and other road vehicles which always are subjected to the worst kind of fine abrasive dust.

In order to obtain the best results from a roller bearing, the rollers should be spaced equally around the shaft. This is accomplished by means of a cage. This inclosure may vary greatly in its details of construction, but all varieties nevertheless follow the same general plan. The one shown in the accompanying illustration, Fig. 1, consists of two end pieces with suitable spacing rods extending between them. The end plates are rings with the internal diameter somewhat greater than the diameter of the shaft, their radial width being less than the diameter of the rollers. The spacers or standards are passed through holes drilled through the end plates and their ends are riveted down flush. The rollers, which are hardened and ground, are provided with projections, or gudgeons, on each end. These fit loosely into holes in the end pieces. The cage thus built up holds the rollers together as a unit, yet leaves them free to roll between the shaft and raceway.

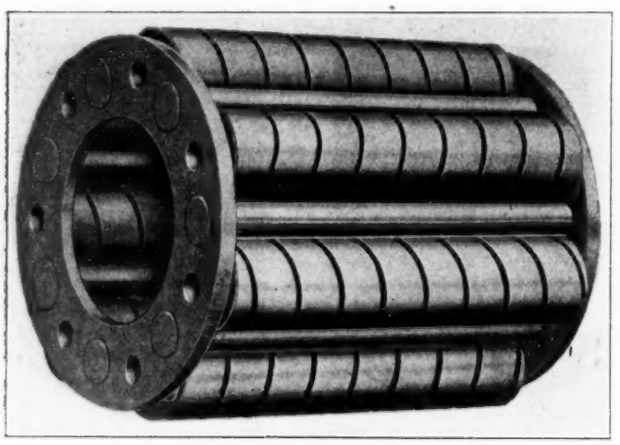


Fig. 2—Another Well-Known Type of Roller Bearing

Here the rollers are wound from high-grade alloy steel. This construction gives greater flexibility and assures larger grease-carrying capacity than is obtained with solid rollers. Winding them alternately right- and left-hand assures proper distribution of lubricant and uniform wear.

Raceway Gives Efficient Bearing to Rollers

In order to assure an efficient bearing for the rollers, the raceway, also shown in the illustration, is provided. This consists of a strap, or plate of steel, the ends of which are male and female V-shapes. This is bent to a circular form after which it is hardened and ground. As will be observed in the illustration the edges of the V's stand apart when the raceway is removed from the bearing. Before it can be slipped into place this opening must be sprung together. The V-shape of the opening avoids all possibility of distinct shock as the rollers cross it. A raceway of this kind assures a smooth, even surface upon which the rollers may operate, and may be renewed with ease if necessary.

In some instances the rollers are made hollow and a spacer is passed through each. This, however, does not in any way alter the basic principle of the bearing. Another type of roller bearing widely adopted in industrial work uses rollers each of which is a helix wound from a rectangular steel rod. Alternate rollers are wound right and left hand so that there is no possibility that they will wear either the raceway or shaft unevenly.

Several advantages are claimed for this type of bearing. In the first place, the rollers, although hardened and ground, are somewhat flexible. As a result, instead of obtaining line contact between roller and raceway or between roller and shaft, which is alone possible theoretically, surface contact, or what might be termed strip contact, is actually obtained. The flexibility of the rollers also permits them to accommodate themselves to any slight inequalities of either shaft or race.

May Take End as well as Radial Stresses

More lubricant can be packed into a bearing of this kind than into one containing solid rollers, and the helical roller carries and distributes this lubricant efficiently throughout all parts of the bearing. Furthermore, this bearing, it is claimed, can absorb more dirt than a solid-roller bearing of the same size and still function satisfactorily. Of course, every precaution is taken to keep foreign material out of anti-friction bearings but the undesired sometimes happens, and dirt and dust find their way into a journal box no matter how thoroughly it may be protected.

All the bearings thus far described are intended to receive radial stresses only; any end thrust that may develop must be absorbed by some other part than the bearing itself. A type of roller bearing intended to take both radial pressure and end thrust is shown in Fig. 3.

In this bearing the rollers or the active portions thereof are not right cylinders but the frustums of cones. These rotate between male and female cone

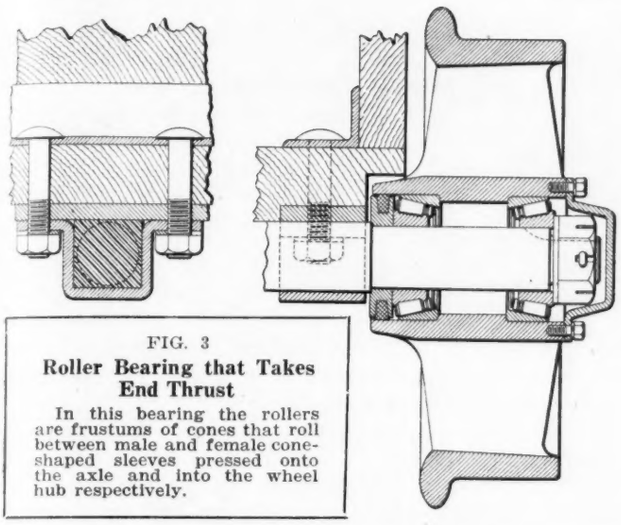


FIG. 3
Roller Bearing that Takes End Thrust
In this bearing the rollers are frustums of cones that roll between male and female cone-shaped sleeves pressed onto the axle and into the wheel hub respectively.

raceways or sleeves pressed upon the shaft and into the wheel hub respectively. It will be apparent at once that any end thrust exerted upon the flange of a mine-car wheel will be transmitted to the axle not through the end of the hub or the wheel cap but through the roller bearing. The axle in the illustration to which reference has been made, except where it passes through the wheel, may be square and bolted securely to the car body. The wheel thus will be free to revolve without end play and without touching anything except the rollers and the dirt-excluding felt washer. Wear to which all bearings are subject may be taken up from time to time as it develops.

So much for the roller bearing. Though the ball bearing possesses certain obvious advantages, it as a rule has been considered too expensive for installation on mine cars. It has, however, found a fairly extensive use on mining locomotives. Here it is employed mainly on the armature shaft although to a lesser extent upon driver journals.

In the ball bearing, hardened steel balls ground to an accurate spherical shape roll between inner and outer races that are likewise hardened, ground and highly polished. Theoretically a ball has only point contact with its race. As, however, this latter member is grooved to a radius only slightly greater than the radius of the ball and as both ball and race are, within limits, thoroughly elastic, small surface contact is secured. Deformation of the ball under normal load should be such as never to exceed or even approach the elastic limit of the hardened steel. The result is that if foreign matter, except lubricant, is excluded from such a bearing, it will operate almost indefinitely without appreciable deterioration.

This latter consideration, namely, absence of wear, renders these bearings particularly applicable to the armature shafts of locomotives where they preserve indefinitely the small interval between the rotor and the pole pieces of the field. Appreciable wear on armature bearings is liable to let the armature down where the action of the field magnets or poles is unequal. Eventually such wear will permit the armature to rub on the poles and thus be quickly ruined.

The ball bearing probably reduces the friction of rotation to a greater degree than does any other type of journal intended to carry heavy loads. The resistance that it offers to rotation is only a fraction of that offered by the ordinary bronze or babbitt-lined bearing.

Anti-friction bearings can eliminate only those power losses that are caused by friction. Thus, suppose that the resistance to the movement of a car or trip provided with plain bearings and moving over a level track is 30 lb. per ton of car or trip weight, and if mounted on anti-friction bearings, this resistance is reduced, say, to 15 lb. per ton. A locomotive of given weight therefore when moving over a level track would be capable of hauling twice as big a load mounted on anti-friction bearings as it would when mounted on plain bearings.

Grades Make a Difference in Power Saved

On grades, however, conditions are somewhat different. Suppose that two trips of equal weight, let us say 100 tons, one provided with plain and the other with roller bearings are to be hauled up a 2-per cent gradient. The drawbar pull in pounds necessary with the plain bearings will be $(100 \times 30) + (100 \times 2{,}000 \times 0.02) = 3{,}000 + 4{,}000 = 7{,}000$ lb. In the case of the trip mounted on anti-friction bearings the necessary drawbar pull under the assumed conditions will be: $(100 \times 15) + (100 \times 2{,}000 \times 0.02) = 1{,}500 + 4{,}000 = 5{,}500$ lb.

Thus, on a level track the saving in power amounts to $\frac{1}{2}$, whereas in the second case assumed it amounts only to $\frac{3}{14}$. However, in any case the saving in drawbar pull is equal to the difference in frictional resistance of the two types of bearings under load on level track. Under conditions as above assumed this is 1,500 lb. In most mines such a saving is certainly worthy of consideration.

Several advantages other than decreased friction inhere to the anti-friction bearing. A recent investigation into the use of this type of bearing as applied to mine cars only, brought out the following interesting details. Of the 750,000 mine cars employed in American coal mines, 376,500 are fitted with plain bearings whereas the rest or 374,500 are equipped with roller bearings. The average lubrication interval or time between lubrications with plain bearings is 24 days, whereas with roller bearings it is 101 days. The average life of a plain bearing is 3.9 years and that of a roller bearing is 6.1 years. The average annual cost of lubricating a car (four wheels) with plain bearings is $4.70 whereas with roller bearings this is reduced to $1.61. Grease appears to be the lubricant all but universally applied to roller bearings, whereas, in general, oil is used with plain bearings.

England Investigates Ball-Bearing Mine Cars

In the United States ball bearings have been little used on mine cars. Some extensive experiments have been made in England, however, with this type of bearing. In a paper read before the North of England Insti-

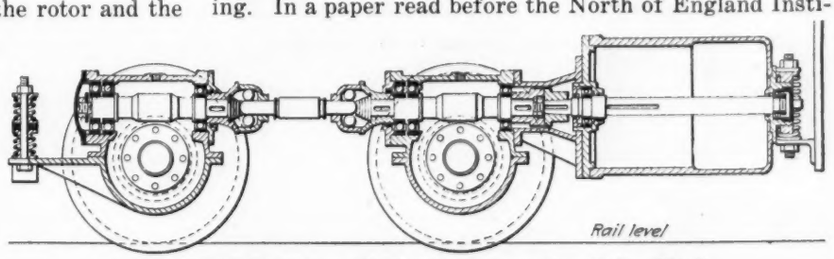


Fig. 4—Ball Bearings Used with Locomotive Drive Shaft
The flexible or segmented drive shaft in this illustration is mounted on ball bearings throughout its entire length. Driver journals may be of either the ball or roller type.

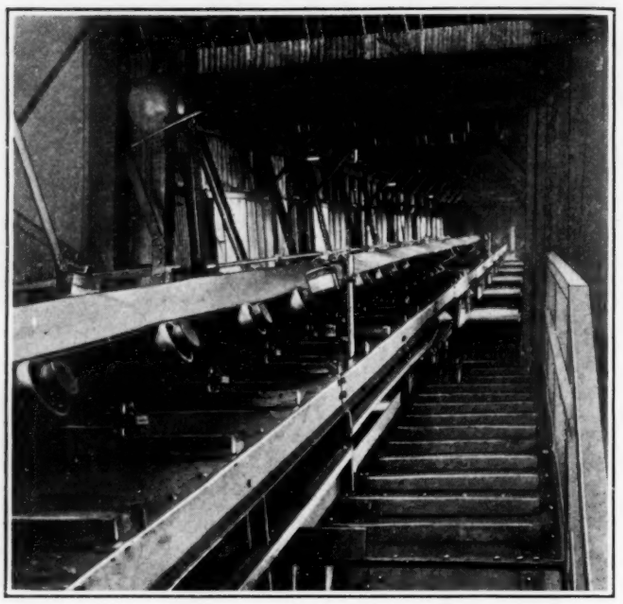


Fig. 5—Conveyor Belt Operating on Roller-Bearing Troughing Idlers

Some power must be expended to trough the belt and elevate the load carried. The useless horsepower or that expended in overcoming idler friction may be materially reduced by the use of anti-friction bearings in the idlers. The power saved by this means is frequently sufficient to pay handsome dividends on the increased investment.

tute of Mining and Mechanical Engineers, Dec. 9, 1922, Appleyard and Macaulay gave an estimate of the savings possible through the substitution of ball-bearing wheels for those fitted with plain bearings. These figures which are given in Table I apply to 2,000 cars with a capacity of about 2¼ tons each.

The saving of $25,077 represents over 28 per cent on a capital expenditure of $87,480. It should also be noted that the savings of which these authors speak do not consider any economies in power whatever. Concerning this phase of the problem they say:

Bearings Save 10 Per Cent of Total Cars

"The saving in power, whether mechanical, animal or human, is so marked, especially at starting, that it can confidently be asserted that it is necessary to use only 90 per cent of the original number of cars to obtain the same service. The extra service that the cars will render is partly attained by the fact that a man can push with ease two ball-bearing cars in places where he can move only one plain-bearing car. This applies also to the haulage performed by ponies. Further, owing to the reduced friction, cars will travel by gravity down inclines where before power had to be used. Thus, with an equal expenditure of power, the number of cars required can be reduced by 10 per cent."

Again the same authors state that by use of anti-friction bearings on a main-and-tail-rope haulage, a trip of ball-bearing cars, though they weigh 4.75 per cent more than a similar plain-bearing trip, can be moved with 8.63 per cent less power than the trip with plain bearings.

Table I—Relative Annual Expenditures, Plain and Ball-Bearing Wheels

	Cost per Year
Plain-bearing wheels	
Oil	$4,082
Cost of applying oil	3,645
Renewal of bushings	29,160
Total expenditure	$36,887
(Cost of changing 2,000 cars from plain to ball bearings, loose-wheel type	$87,480
Ball-bearing wheels	
Interest at 6 per cent	$5,249
Depreciation of bearings	4,860
Grease (4 lb. per car per year @ 12.15c. per lb.)	972
Grease application and bearing inspection	729
Total expenditure	$11,810

Table II—Data of Tests of Two Conveyors with and Without Roller Bearings

	Conveyor No. 1	Conveyor No. 2
Belt width	48 in.	48 in.
Conveyor length	381 ft. 4 in.	404 ft. 5 in.
Conveyor lift	108 ft. 1 in.	119.13 ft.
Measured speed, ft. per min.	483.5	505.6
Measured capacity, tons per hour	795.	1,020.52
Horsepower (plain bearings)	140.8	180.34
Horsepower (roller bearings)	106.8	148.40
Horsepower (to elevate load)	86.8	122.80
Frictional hp. (plain bearings)	54.	57.54
Frictional hp. (roller bearings)	20.	25.6
Saving through use of roller bearings hp.	34.	31.94
Per cent saving	62.9	55.5

Experiments were also made to ascertain the effort necessarily expended in starting plain- and anti-friction cars of the same weight upon level track and also to determine the pull required to keep such cars in motion. Cars weighing 1,008 lb. and exactly similar, except for the bearings, were used in this test. It was found that it required 12 lb. to start a ball-bearing car, whereas 29 lb. was necessary to start one having plain bearings. Similarly, it took a pull of 6 lb. to keep a ball-bearing car moving at 2 miles per hour over a level track but required 22 lb. to keep a plain-bearing car traveling at the same rate.

Save Power When Used with Belt Conveyors

In its issue of Feb. 23, 1923, p. 452, the *Colliery Guardian* prints the results of some interesting tests on anti-friction bearings as applied to belt conveyors. The results of these tests are summarized in Table II.

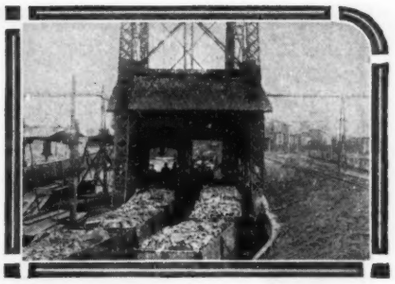
Assuming that power costs 3c. per kilowatt-hour or 2¼c. per horsepower-hour and that the conveyor operates 8 hr. per day, 300 days per year, or a total of 2,400 hr. per year, the cost of driving it per horsepower per year will be $54. A reduction of 34 hp. in the energy needed to drive a conveyor of this kind, such as Table II shows can be accomplished, would mean, assuming an over-all motor efficiency of 75 per cent, a monetary saving of roughly $2,450 per year.

Other savings also are possible. Thus in a new installation the rating of the driving motor as well as the weight of the belt may be reduced. In an actual instance a 75-hp. motor was installed to drive a conveyor fitted with roller-bearing idlers, whereas a 100-hp. machine would have been necessary with plain-bearing idlers. In another case a 7-ply belt was strong enough with roller-bearing idlers, but a 9-ply belt would have been necessary had plain bearings been used.

The anti-friction bearing has entered the coal industry to stay. When competition is keen advantage must be taken of any device that will lower the cost per ton. Though such bearings will doubtless withstand much abuse and neglect, they were not designed with the idea that they should logically receive such treatment. Adequate care, therefore, in their lubrication and maintenance will be amply repaid.

Prof. A. C. Allen, head of the department of mining engineering, West Virginia University, Morgantown, W. Va., who came to that institution from the University of Illinois, Urbana, Ill. in 1917, returns to his alma mater to become dean of the school of mines. He will complete the conduct of the regular short course in mining at West Virginia University before leaving.

News Of the Industry



Cincinnati Coal Convention and Machinery Exhibit Plans Taking Shape

Public Meeting to Be Held in Music Hall — Talks Will Be Broadcast by Radio—S. B. Crowell and H. L. Gandy to Make Addresses —Live Topics for Discussion

Details of the program for the seventh annual meeting of the National Coal Association, which will be held in Cincinnati May 14, 15 and 16, are being perfected rapidly but have not yet been fully completed.

W. E. E. Koepler, chairman of the Committee on Arrangements, has just announced two important events. One is that arrangements are being made for a big public meeting in Music Hall, where the American Mining Congress will present its National Exposition of Mining Machinery and Mine Equipment, which will be addressed by prominent speakers whose talks will be broadcast by radio. The other is that Samuel B. Crowell, of Philadelphia, president of the National Retail Coal Merchants' Association, has accepted an invitation from the National Coal Association to address the convention on the forenoon of May 15.

The program at Music Hall will include among the speakers Harry L. Gandy, executive secretary of the National Coal Association. This meeting, to be held on the evening of May 14, will give time for delegates to visit the exposition of mining machinery and to meet the manufacturers who have displays of equipment there. Mr. Crowell will address the coal operators on "Our Customers," and it is expected that he will dwell upon the importance of a better understanding between all branches of the coal industry and the public. Mr. Crowell is an earnest advocate of the formation of a Coal Institute, regarding which various major groups of the industry have committees now at work.

Seek Lower-Cost Output

The American Mining Congress, through its secretary, J. S. Callbreath, has issued a special invitation to members of the National Coal Association to attend the Exposition of Coal Mining Equipment, which will be staged during the week of the association convention, and to join in the discussions of practical operating problems of the coal industry which will be taken up there. In a letter to Secretary Gandy, Mr. Callbreath expresses the opinion that "the outstanding problem of the coal industry is to obtain lower cost per ton of coal. The continued existence of many coal enterprises is largely dependent upon the successful solution of this problem."

Mr. Callbreath outlines five important topics which will be discussed in Cincinnati at the National Exposition of Coal Mining Equipment and Machinery. These are:

To Discuss Live Topics

"(1) Problems of Mine Electrical Men.—The discussions of this topic will be under the leadership of Graham Bright, well-known consulting engineer, and will cover all the different phases of the effective uses of electrical power in connection with coal-mining enterprises. The leaders in this discussion are all well-known and representative operating engineers and will take up various phases of the problems of mine electrical equipment.

"(2) No subject is of greater interest to coal-mine operators than the equipment used in the preparation of coal. Colonel Warren R. Roberts, president of Roberts & Schaefer, will act as chairman of this meeting and there will be a general discussion of the new dry cleaning processes and of the various phases of primary and secondary preparation of coal.

"(3) How to increase the percentage of lump coal by better blasting methods is another topic of interest to all coal operating officials. Considerable experimentation has been done in obtaining better blasting methods and there will be an interesting discussion of this problem at Cincinnati.

"(4) An outstanding problem in obtaining greater economies in coal production is the correlation of mechanical loading with haulage and mining problems. Two afternoons of the week, Wednesday, May 14, and Thursday, May 15, will be given up to discussion of this phase of mine operation. There will be an interesting presentation and an analysis of the use of mechanical loaders in coal-mining properties.

"(5) The final discussions of Friday afternoon, May 16, will be devoted to the topic 'Necessity for Rock Dusting.' The chairman of this meeting will be John E. Jones, safety engineer of the Old Ben Coal Corporation, Chicago, a company which has been a pioneer in the installation of rock dusting as a means of eliminating dangerous explosive conditions in coal mines."

C. & O. New Equipment To Cost $28,000,000

The Chesapeake & Ohio R.R. has placed contracts for $28,000,000 worth of new equipment, according to an announcement by W. J. Harahan, president of the company. The orders placed include 5,500 hopper cars, 2,000 automobile cars, 600 ballast cars, 120 cabooses, 15 express cars and 100 locomotives. More than 100,000 tons of steel will be required to construct the equipment, it is said.

This will add more than 13 per cent to the coal-carrying facilities of the road, as it now has 41,820 coal cars. The Hocking Valley R.R., a subsidiary of the C. & O., owns about 12,000 coal cars.

Indiana Companies Join Merger Movement

Announcement has been made that negotiations for the consolidation of the Knox Coal Mining Co., the Howe-Coulter Coal Co. and the Panhandle Coal Co., owners of four mines in the Bicknell (Ind.) district, having a total production capacity of 1,000,000 tons annually, will be completed in a few days. The new organization, a name for which has not yet been chosen, will be capitalized for $1,500,000. H. A. Husky, of Chicago, president of the Knox company, will head the new organization.

William Schrolucke, of Indianapolis, president of the Panhandle company, will be the vice-president and chairman of the board of directors; William H. Abraham, secretary-treasurer of the Panhandle company, probably will be secretary; W. P. Worth, treasurer of the Knox company, probably will be treasurer. Carl J. Fletcher, secretary of the Knox company, will be the general manager of the new company, and Wesley Harris will be in charge of the mine operations.

These men and another to be chosen, will form the directorate. The Howe company will not be represented on the list of officers. Mr. Fletcher said the consolidation will bring about cheaper production, the new company being able to operate part of its mines full time instead of having all four mines operate part time. Cheaper production is necessary to meet competition from non-union fields, Mr. Fletcher said. One of the mines now is being operated full time, and it is expected that another will be working at capacity in a few weeks.

Leon Besson

On April 1, Leon Besson became chief mine inspector for Kansas, succeeding James Sherwood, who returns to the service of the Associated Companies, handling mine liability insurance. The appointment of Besson by Governor Jonathan Davis has caused some political disturbance in the state because Besson is a socialist and was opposed by some good Democrats of the Governor's party. His choices of assistants are expected to cause some more disturbance.

Railways May Get Fuel Research Bureau

There has been so much confusion for years in the minds of railway fuel engineers as to the actual fuel value ratio between coals and oils that a bureau of research may be set up to make exhaustive studies of that and other fuel problems. The plan was approved a week ago at a Chicago meeting of the joint fuel conservation committee of the American Railway Association and the International Railway Fuel Association. The plan goes now to the American Railway Association's directorate for approval.

Other problems to be submitted to the research director for solution relate to the utilization of lignite coal, results obtained from relative grades of coal in relation to the cost involved, spark losses, the effect of electrification on fuel consumption per ton-mile and per passenger car-mile, the economic aspects of coal storage, influence of locomotive design on fuel economy, introduction of turbine-driven and Diesel motor type locomotives, etc.

At the meeting in Chicago the committees decided upon the text of a questionnaire to be submitted to all the railroads for the purpose of determining actual progress toward fuel conservation and what fuel-economy practices have been generally adopted. The first three booklets of the American Railway Association's manual on fuel and related economies as compiled by the International Railway Fuel Association also were approved at this meeting and will soon be available for distribution to the railways.

Mine Inspectors Prepare For Big Meeting

Safety in coal mines, viewed from many slants will be much at the fore in Cincinnati the week of May 12 not only because the American Mining Congress will pay attention to it but also because the Mine Inspectors' Institute of America will be in annual session there from the 14th to the 16th with a program that will be devoted 100 per cent to safety. Men from many states whose daily work is to make mines safe will assemble in the Sinton Hotel.

An official announcement by James Sherwood, president, of Pittsburg, Kan., says that all members of the Institute and all state or provincial mine inspectors in America are invited to study the program and either be present prepared to talk on one or more of the subjects or mail Mr. Sherwood papers they may write. The Institute is going to devote a good deal of time to the question of standardizing the safety laws of the country. So a committee composed of Dr. J. J. Rutledge, chief mine engineer for the Maryland Bureau of Mines; James Dalrymple, chief mine inspector for Colorado, and R. M. Lambie, chief inspector for West Virginia, will meet in Cincinnati two days in advance and prepare an outline for a standardization discussion at the forthcoming convention.

The outline of other subjects to be discussed follows:

(1) Qualifications of coal-mine inspectors, both as to practical experience and technical knowledge. James Dalrymple, chief, Colorado.

(2) Closed lights in all coal mines. Dr. J. J. Rutledge, chief, Bureau of Mines, Maryland.

(3) Systematic timbering. R. M. Lambie, chief, West Virginia.

(4) How lives and property may be best protected by inspection. V. E. Sullivan, inspector, West Virginia.

(5) Guarding and protecting of electrical wiring and equipment in coal mines. Jerome Watson, chief, Division of Mines, Ohio.

(6) Precautions and suitable pillars between working mines and abandoned mines filled with water. J. E. Holland, chief, Iowa.

(7) Should coal be shot from the solid under any conditions in any state? And why? G. B. Butterfield, general manager, Associated Companies, Connecticut.

(8) First-aid and safety organization. H. H. Warner, senior inspector, Associated Companies, Colorado.

(9) The necessity of getting the proceedings of the annual report of the meeting of the Mine Inspectors' Institute of America into the hands of the mine workers and mine managers. J. E. Roberts, chief, Missouri.

(10) The relation of accidents to lack of discipline and enforcement of safety rules. Prof. G. E. Abernathy, State Mining College, Pittsburg, Kan.

Walsh Favors Rock Dusting

Joseph J. Walsh, State Secretary of Mines, of Pennsylvania, has called a meeting of all the inspectors in the Pittsburgh district, to be held late this month, to urge the adoption of rock dusting to prevent coal-dust explosions in bituminous mines. In the past explosions of air heavily laden with coal dust has been responsible, says a department statement, for some of the most disastrous explosions in the soft-coal mines.

F. G. Wilcox

Appointed a director, president and general manager of the Price-Pancoast Coal Co., the West End Coal Co. and the Melville Coal Co. in succession to the late William L. Allen. Mr. Wilcox has had 20 years' experience in the coal industry, having joined the Hillside Coal & Iron Co., in 1904, when he was graduated from Lafayette College. He became associated with the Price-Pancoast Coal Co. in 1918.

Low Bids for Navy Coal

Bids opened by the U. S. Shipping Board at New York on April 18 for furnishing and delivering alongside vessels in that harbor 1,065 gross tons of bituminous coal equal to either Pool 71 or 9 brought tenders from seven coal firms with prices ranging from $4.23 per gross ton to $4.97, or on a basis of $1.03 to $1.70 per net ton f.o.b. mine. The bidders and prices submitted were: Whitney & Kemmerer, $4.85 per gross ton, f.a.s.; H. B. W. Haff, $4.75; B. J. Lynch, $4.97; W. A. Marshall & Co., $4.62; Rhodes Fuel Corporation, $4.54; Flack & Son, $4.44, and Seiler Coal Co., $4.23.

Brazil Block Operators to Sign Union Contract

The scale committee of the United Mine Workers of District No. 8, with headquarters at Brazil, Ind., and the Brazil Block Coal Producers' Association are holding a joint meeting to sign up a new mining contract. It is understood the contract is agreeable to all parties, but the delay in signing has been caused by failure of the wagon-mine owners to get together and complete the organization of their association.

Growth of West Virginia Coal Fields Laid to Freedom from Union Domination

B. M. Clark, president of the Association of Bituminous Coal Operators of Central Pennsylvania, takes issue sharply with some of the statements of John Brophy, president of District No. 2, United Mine Workers, made in reply to comment by Mr. Clark on the recent wage agreement. Mr. Clark says:

"The assertion made by the United Mine Workers that 'for a remedy they [the operators] suggest the same old panacea they have been offering for the past thirty years—lower wages' is not in accord with the facts. During the past thirty years and since I have been president of the operators' association, wages in the union mines have increased over 240 per cent. This speaks for itself.

"The present wage agreement, signed for a period of three years, will be carried out as faithfully by the operators (unless the United Mine Workers revise it) as all preceding agreements we have signed with them have been carried out during the past twenty-five years. The matter of changes in the contract rests entirely with the union.

"It is my opinion, however, that economic forces operating today will exercise a compelling influence upon the judgment of the United Mine Workers just as these forces will influence the judgment of the rest of us during the next three years. The law of supply and demand operates in the coal industry. People will buy coal or any other commodity at the lowest price obtainable. That section of the coal industry or any other industry that cannot produce at a cost below the market price will go out of business. Central Pennsylvania cannot produce coal at the selling prices in the market today. The effect of the law of supply and demand is as inevitable as time.

Says Overdevelopment Is Serious

"Overdevelopment of the bituminous-coal mining industry is not questioned. The extent of that overdevelopment, however, is a question upon which experts disagree. I am not sure that we can produce twice as much coal as we need. The overdevelopment, however, is sufficient to be serious for those who have their money invested in coal mining.

"Overdevelopment will continue to increase in the non-union sections of the country as long as the union is able to maintain such a high wage schedule in the union fields as to permit the non-union operators to make profits on selling prices that are below the cost of production in the union fields. That is the condition now. The policy of the United Mine Workers accounts in part for the overdevelopment of the industry. The development of the non-union coal fields of West Virginia is one of the industrial marvels of the past twenty years. This development has taken place during the period of growth and increase of power of the United Mine Workers in the older fields. It cannot be seriously questioned that the great mining development of West Virginia is due to its policy of employing non-union labor.

"The real facts as to actual cars of coal loaded in the central Pennsylvania district as compared with the Pocahontas and New River districts of West Virginia are as follows: In January, 1923, Pocahontas loaded 80,725 cars; in January, 1924, 106,403, or an increase of 25,678 cars. In January, 1923, central Pennsylvania loaded 72,570 cars; in January, 1924, 59,402, or a decrease of 13,168 cars. In February, 1923, Pocahontas loaded 82,484 cars; in February, 1924, 117,769, or an increase of 35,285 cars. In February, 1923, central Pennsylvania loaded 70,006 cars; in February, 1924, 62,757, or a decrease of 7,249 cars. From March 1 to 15, 1923, Pocahontas loaded 68,785 cars; the same period, 1924, 87,970, or an increase of 19,185 cars. From March 1 to 15, 1923, central Pennsylvania loaded 54,768 cars; in the same period, 1924, 46,011, or a decrease of 8,767 cars.

Pocahontas Forges Ahead

"During these months in 1923 business was good in the coal industry and everybody had orders. The results for that period show the relation between these fields when competitive conditions are equal. The increase in car loadings in the Pocahontas district and the decrease in the central Pennsylvania district show accurately the results of the present competitive situation. In a falling or depressed market up to March 15, this year, the Pocahontas district has increased its loadings approximately 35 per cent over its loadings during a period of good demand for coal, whereas the central Pennsylvania district shows a decrease in its loadings in 1924 as compared with 1923 of 15 per cent. The weekly car loadings in central Pennsylvania have often exceeded 24,000. For the week ending April 5 the total loadings in the central Pennsylvania district were but 8,975, the lowest output on record during a period of no strike. The business is going to the non-union fields of West Virginia."

Miners Boom Pinchot for Presidential Delegate

Governor Pinchot has made public a telegram received from the miners in District No. 2, United Mine Workers, endorsing his candidacy for delegate at large to the Republican National Convention. Resolutions passed by the miners' executive board lauded the Governor for his "fairness to labor" and urged every mine worker to record his approval of the Governor's labor policy by voting for Mr. Pinchot.

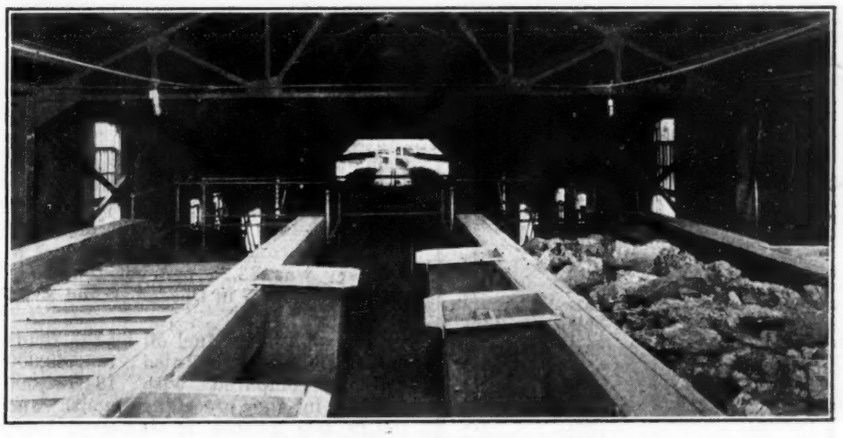
The telegram, sent from Clearfield, Pa., reads: "District No. 2 executive board passed following resolution today: 'In view of Governor Gifford Pinchot's fairness to labor, the executive board of District No. 2, United Mine Workers of America, ask mine workers and their friends who are Republicans to vote for him in the primary election, April 22, for delegate at large to the Republican National Convention.'"

All Quiet on Straight Creek

Things have been so quiet at Pineville and at the Liberty Coal & Coke Co. plant at Straight Creek, Ky., that the military protection has been reduced to about two companies, there having been no shooting or other disturbances for a week. Two companies have been withdrawn.

After failure to accomplish anything in a conference April 12 with union leaders and company officials regarding arbitration Governor Fields arranged to go to Straight Creek for further conferences, to include the company's own workers, but he has postponed his trip from day to day.

Federal Judge A. M. J. Cochran has granted a preliminary injunction enjoining the International union and its officers, the district union and its officers and the local union and its officers from interfering with officers, agents or employees of the company in the performance of their duties.



Picking Tables of Clearfield Bituminous Corporation, Rossiter, Pa.
Large pockets are provided for the removal of the refuse contained in the coal.

Coal Bids for Schools of New York Opened

Bids opened by the Board of Education of New York City on April 14 for furnishing, delivering, storing and trimming about 160,000 net tons of hard and soft coal to the school houses and offices of that body for the period ending April 30, 1925, showed a variety of prices ranging from $10.61 for broken coal in the Borough of Manhattan to $13.75 for chestnut in Richmond Borough. The amounts required are 40,900 tons of broken; 99,050 tons No. 1 buckwheat; 7,440 tons bituminous mine-run; 6,880 tons pea coal; 1,900 tons egg; 2,440 tons stove coal and 140 tons chestnut size. There were 17 bidders, some of whom bid only on individual lots in some of the boroughs.

In Manhattan the tenders on broken and egg coals ranged from $10.61 to $12.83 per ton; stove and chestnut, $10.68 to $12.83; pea coal, $7.36 to $9.12; No. 1 buckwheat, $5.22 to $6.53; soft coal, $5.24 to $6.46.

Bronx—Broken coal, $10.66 to $12.48; egg, stove and chestnut $10.72 to $13.48; pea coal, $7.30 to $9.12; No. 1 buckwheat, $5.26 to $6.53; soft coal, $5.14 to $6.46.

Brooklyn—Broken, $11.23 to $12.42; egg, stove and chestnut, $11.37 to $12.42; pea coal, $6.98 to $9.35; No. 1 buckwheat, $4.98 to $6.36 and soft coal, $5.14 to $6.49.

Queens—Broken, $11.23 to $12.70; egg, stove and chestnut, $11.37 to $13.20; pea coal, $6.98 to $9.50; No. 1 buckwheat, $5.13 to $6.48, soft coal, $5.14 to $6.45.

Richmond—Broken, $12.09 to $13.50; egg, $12.68 to $13.75; stove and chestnut, $12.75 to $13.75; pea coal, $7.14 to $9.95; No. 1 buckwheat, $5.45 to $7.14. soft coal, $6.19 to $7.14.

For delivering 3,600 tons of soft coal, mine run to the Parental School in Queens the bids ranged from $5.14 to $5.40 per ton.

How New Immigration Law Affects Old Quotas

Washington, D. C., April 19.—The Senate passed the immigration bill tonight by a vote of 62 to 6 after discussion lasting about seven hours. The bill restricts immigration to 2 per cent on the basis of the 1890 census, which cuts the total quota from 357,801 to 161,990. The Senate adopted an amendment giving preference in admissions to persons skilled in agriculture, but in other salient features the Senate bill is in substantial accord with the Johnson bill as passed by the House. The measure will now go to conference and early agreement is expected. Predictions among Senators were that the President would not veto it. The annual quotas from principal countries under the old law as compared with those permitted under the new are as follows:

Country	Present Law	New Bill
Great Britain and Ireland	77,342	62,558
Germany	67,607	50,229
Italy	42,057	3,989
Poland	30,979	8,972
Russia	24,405	1,892
Sweden	20,042	9,661
Czechoslovakia	14,357	1,973
Norway	12,205	6,553
Rumania	7,419	731
Austria	7,342	1,090
Jugoslavia	6,426	835
Hungary	5,747	588
France	5,729	3,978
Denmark	5,619	2,882
Finland	3,921	245
Switzerland	3,752	2,181
Netherlands	3,602	1,737
Greece	3,063	135
Turkey	2,654	123
Lithuania	2,622	402
Portugal	2,465	574
Belgium	1,563	609
Latvia	1,540	217
Esthonia	1,348	202

Lake Navigation Opens

The freight navigation season for 1924 on the Great Lakes was opened April 19 with the passage through the Soo locks of the steamers Theodore Wickwire Jr. and Frank H. Goodyear, laden with coal for Sault Ste. Marie, Ont.

Union Rebels Still Fighting For Alex Howat

The struggle to get Alex Howat back into the Mine Workers union still has some life. The radical voices were scheduled to be lifted up again at the convention of Illinois Subdistrict No. 4, at Auburn, Ill., on the 23d. John Watt, secretary of the subdistrict, said that a resolution for a special International union convention to reconsider the Howat case would be passed. He asserted that the demand for such a special convention will be backed by Illinois, Michigan, Kansas, Washington, Montana, Wyoming, Nova Scotia and Vancouver.

Dissatisfaction of some Illinois mine workers with the new three-year union agreement with operators also will break into voice, he said. A good deal of dissatisfaction exists throughout the state because the miners think they are going to get very little work under such an agreement. They expect nearby non-union districts to win much of Illinois' markets.

Railroads Consume 9,432,000 Tons of Coal in January

Class 1 railroads of the United States consumed 9,432,000 net tons of coal during January, compared with 8,647,000 tons in the preceding month and 10,375,000 tons in January, 1923, according to a report by the Bureau of Statistics of the Interstate Commerce Commission covering 176 steam roads. During 1923 these roads consumed a total of 109,442,000 tons, compared with 96,077,000 tons in 1922. The delivered cost of coal consumed in road service in January was $3.25 per net ton, compared with $3.27 in December and $3.73 in January, 1923.

Consumption of fuel oil by the roads during January totaled 188,842,000 gallons, compared with 184,722,000 gallons in the preceding month and 150,297,000 gallons in January, 1923. During 1923 the roads consumed 1,980,015,000 gallons, compared with 1,556,090,000 gallons in 1922.

Roads Break Traffic Records

Two new high records were established by Class 1 railroads of the country during February, according to the Bureau of Railway Economics. They handled the greatest volume of freight traffic, measured in net ton miles, carried during any February in history and the average daily movement per freight car for the month was 27.4 miles per day, the highest for any February on record.

Freight traffic in February amounted to 35,962,421,000 net ton miles, an increase of 3,332,065,000 or 10.2 per cent, over the same month last year, and an increase of 3,010,289,000 net tons miles or 9.1 per cent, over February, 1920, which was the previous record month. Compared with 1922, it was an increase of 7,511,508,000 net ton miles, or 26.4 per cent. For the months of January and February alone, freight traffic amounted to 70,463,134,000 net ton miles, the greatest volume ever handled by the railroads during the first two months in any year.

In attaining a daily average movement of 27.4 miles per freight car, the railroads of the country in February exceeded the same month last year by 2.6 miles, and February, 1920, by 5.1 miles. The average also exceeded that for January this year by 2.4 miles.

The average load per freight car in February was 27.6 tons, a decrease of 0.6 ton compared with the same month last year and 0.7 of a ton decrease compared with February, 1920.

Pinchot Publishes His Coal Exploits

Governor Pinchot of Pennsylvania has been issuing weekly statements to the newspapers giving in detail his own account of his administration. In his release of April 10 he tells of the settlement of the anthracite strike of last summer.

"When I came into office," he stated, "the whole state was suffering from a shortage of coal. Houses were poorly heated and disease increased so greatly that 6,000 persons lost their lives who probably would have been living today had there been no shortage of coal. That struggle between miners and operators cost $30,000,000.

"Last fall the state and the nation were confronted with the probability of another coal shortage. Thereupon representatives of miners and operators were invited to Harrisburg, the public necessity of preventing a strike was laid plainly before them, and when the deliberations were over the strike had been settled. Thereby those who could not otherwise have got coal were enabled to secure it, while the few who might have got it in spite of the strike secured it at far less cost than they would otherwise have had to pay. Another heavy loss of life, comfort and money was thus averted."

U. S. Commerce Chamber to Discuss Natural Resources And Trade Associations

Natural resources and trade associations and their activities are among the score or more of topics of interest to the coal industry that will be discussed at the annual meeting of the Chamber of Commerce of the United States, to be held at Cleveland, Ohio, May 6-8. Other subjects that will be taken up include taxation, transportation, industrial relations, industrial mobilization, immigration and national economy.

The subject of natural resources will be considered at a group meeting to be held at 2 p.m., May 7, in the ballroom of the Hollenden Hotel. At this meeting, which will be held under the auspices of the Chamber's Natural Resources Production Department, of which W. DuB. Brookings is manager, James R. Garfield, former Secretary of Interior, will speak on "Government Control of Natural Resources"; Paul Armitage, of New York, chairman of the Tax Committee of the American Mining Congress, will discuss "Tax Problems in Relation to Reserves and Depletion of Natural Resources," and Goldthwaite H. Dorr, of New York, formerly counsel for the Bituminous Operators' Special Committee, appointed to co-operate with the U. S. Coal Commission in investigating and determining the facts about the bituminous-coal industry, will read a paper on "Trade Association Problems Relating to Natural-Resource Industries."

Trade Associations Prove Magnet

Three separate proposals concerning trade associations have been submitted by member organizations of the National Chamber for consideration, as follows:

The Memphis Chamber of Commerce proposes that the National Chamber advocate creation of a commission which would define the rights of trade associations and their members in all respects, including their rights to discuss operating expense, sources of supplies for materials, prices, trade competition, etc. A study of anti-trust laws and of the Federal Trade Commission's powers and activities would be included. The purpose of this is to establish recognized principles which would remove handicaps under which trade associations now operate, through fear that they may violate some law, rule or regulation and be called before a commission or the courts upon a criminal or civil charge, the existence of which, regardless of the merits, is detrimental.

The Southern Central Division of the National Chamber recommends that all possible steps be taken to effect elimination of obstacles and uncertainties which interfere with the most effective carrying out by trade associations of their function of disseminating information.

The National Coal Association proposes that the President of the United States be asked by the National Chamber to direct the Attorney-General to institute a test case of such a character that it will determine the legal status of activities of trade associations in gathering and giving to the public statistical information concerning production, distribution, cost and prices when no improper private use of such statistical information by the association or its members is alleged.

Charles E. Karstrom

Here is a man who is becoming a more important figure in the Illinois coal industry. He is now president of the Harrisburg Colliery Co. and vice-president of the Shoal Creek Coal Co. In March, *Coal Age* reported the purchase of the Harco mine in Saline County, Illinois, by interests affiliated with Big Creek Coals, Inc., a concern which operates other mines in Saline County and which, by reason of the purchase, now operates the Harco mine. Mr. Karstrom is 36. He began his career in the coal business by entering the employ of Big Creek Coals, Inc., and grew in that concern until he was made vice-president. In 1920 he became vice-president of the Shoal Creek Coal Co. His offices are in Chicago.

Lehigh Section A.I.E.E. Holds Anthracite Session

Members of the Lehigh section of the American Institute of Electrical Engineers met April 11 and 12 in Wilkes-Barre for another session in the anthracite region. On the first evening papers were read by Carl P. Brodhun and Lawrence W. Bevan on electric cables and wire ropes, a feature of the session being motion pictures of the Ashley Planes. Here the Jersey Central R. R. hoists in 24 hours 37,200 tons of coal to an elevation of over 1,000 ft. Henry Schroeder, of the Edison lamp works, gave an illustrated lecture on the history and manufacture of electric lamps.

On Saturday morning the members and guests of the society were entertained at the Hazard Manufacturing Co.'s plant, where they were personally conducted through the plant and shown every detail of the manufacture of electric conductors and haulage ropes. In the afternoon the party journeyed to Scranton and a similar inspection tour was made through the General Electric lamp works.

French Coal Output in 1923 Near Pre-War Level

French coal mines in 1923 produced 38,576,215 metric tons (37,714,393 tons of coal and 861,822 tons of coke) compared with a production of 41,000,000 metric tons in 1913 (40,501,000 tons of coal and 793,000 of lignite). Immediately after the war, as a consequence of German systematic devastation of the mines of the northern districts, the output was reduced by about 50 per cent. In 1919 it did not quite reach 23,000,000 tons (21,567,000 tons of coal and 909,757 of lignite). Since then the output has been steadily increasing, and the gain which was not halted by the great economic crisis of 1920-21, was especially marked in 1923.

Coal Output by French Mines

(In metric tons, of 2,204.6 lb.)

Years	Coal	Lignite
1913	40,051,000	793,000
1919	21,567,000	909,757
1920	24,393,228	971,076
1921	28,240,887	735,608
1922	31,940,000	758,000
1923	37,714,393	861,822

Such progress was made possible only through the most active, persistent prosecution of reconstruction of the mines destroyed in 1918 by the Germans. In 1923 the output of the mines of the departments of Nord and Pas-de-Calais amounted to about 20,900,000 tons, the figures for preceding years being shown in the following table, in metric tons:

1913	27,000,000
1919	7,000,000
1920	9,700,000
1921	13,500,000
1922	15,400,000
1923	20,900,000

French Production of Metallurgical Coke

(In thousands of metric tons)

	1921	1922	1923
Coke produced in coke ovens of metallurgical plants	1,039	1,509	2,300
Coke produced in the coke ovens attached to the mines	745	1,031	1,986
Total	1,784	2,540	4,286

French Coal and Coke Consumption

(In thousands of metric tons)

	Production	Imports	Exports	Consumption
1919	21,567	22,262	590	43,239
1920	24,303	28,041	465	51,879
1921	28,241	22,719	2,192	48,768
1922	31,940	27,474	2,567	56,847
1923	37,714	29,987	2,772	64,839

Two Illinois Operators Are Back in the National

Two important Illinois coal-operating concerns recently rejoined the National Coal Association. They are the Chicago, Wilmington & Franklin Coal Co. and the J. K. Dering Coal Co. These are the first to re-enter the association since the disaffection which was started more than two years ago by the withdrawal of the Peabody Coal Co. Later the withdrawal of the State of Illinois was complete. The general complaint was that the National cost more than it was worth. The value of having national representation, however, has since been realized by some Illinois operators. Also the National has removed some of the objections raised against its expensiveness. But there is no landslide of Illinois back into the association yet.

Problems In Underground Management

Concreting a Main Hoisting Shaft While Mine Continues in Operation

Concrete Mixed on the Surface and Poured Down 4-In. Pipe—Shaft Enlarged 8 In. Each Way—Hoisting Uninterrupted for Two Shifts Each Day

By J. W. Powell
Contracting Engineer, Welch, W. Va.

CONCRETING the main hoisting shaft of a coal mine without in any way interfering with operations is a job that is not without its difficulties, but the following description of the concreting of the main hoisting shaft of the E. E. White Coal Co.'s mine at Glen White, W. Va., shows that attacked in the right way the work can be done effectively and without waste of effort. This shaft, which is 13x31 ft. in outside dimensions and 307 ft. deep, contained three compartments. It was originally timbered throughout with 8x10 oak timbers. End and side plates were backed with 2-in. oak lagging placed skin to skin. Sets were placed on 5-ft. centers and the buntons were 8x10-in. timbers with the 8-in. face vertical. The punch posts on the corners were 10x10 in. and 8x10 in. where they supported the cross buntons of the compartments. In order to render the shaft capable of accommodating larger equipment which it is intended to install later, the inside dimensions were increased 8 in., both in length and breadth.

Preparation for concreting was begun from the top of the water ring midway in the shaft and carried upward to the concrete previously placed below the shaft collar. All lagging, back filling and loose rock on the shaft ribs were taken out and the ribs carefully trimmed. Next, the sides of the shaft were thoroughly washed down with water from a hose which was connected to the water system at the top of the shaft, great care being taken to see that all mud and slime, which had accumulated upon the ribs during past years was thoroughly removed. This was considered a highly important portion of the work, for without it a proper bond could not be obtained between the concrete and the walls of the shaft.

After a section of the shaft, equal in length to eight or ten sets of timbers, had been prepared in the manner above described, a foundation platform was built as well as the first 5-ft. form. This was closely calked to prevent the concrete from leaking when pouring was begun. The forms were built in 5-ft. sections and made of 2-in. planks surfaced on one side. Five sets of forms were built, and when the last was placed the first was transferred from the bottom to the top, the wall being continued upward in this manner.

Where springs of water were encountered in the walls of the shaft 1½ in. drain pipes were placed to relieve the pressure while the concrete was setting. These pipes were covered with a ball of cotton waste tied over their inner ends next to the rib of the shaft so as to prevent blockage by the concrete. This waste was afterwards fished out through the pipes by means of a hook, thus allowing the water to flow freely. A sleeve was placed on the inside end of the drainage pipe so that it could be plugged after the concrete had become set and firm.

In the accompanying illustration, *A* shows a general plan and vertical section of the shaft, as well as the method by which the shaft was concreted. A ¾-yd. gasoline-driven concrete mixer was employed in this work. This was connected by means of a sheet iron chute about 4ft. long to the top of a 4-in. iron pipe which was suspended in the shaft by a ⅝-in. cable, the upper end of which was clamped to the headframe of the shaft. Every 40 ft., or every two pipe lengths, the pipe was attached securely to the cable by means of a specially designed clamp. Otherwise the pipe was allowed to swing freely in the shaft. By this means, it could be pulled easily over to any point desired for the pouring of the concrete.

A detail of the attachment of the rope to the pipe is shown at *C*, the specially designed deflection box for the concrete being shown at *B*. With this combination of a loose swinging pipe and a deflection box, it was possible to eliminate entirely all chutes for conveying the concrete behind the forms. In the illustration, *D* shows a section of timbers removed and faced with concrete flush with the finished walls of the shaft.

A 1:2:4 mixture was used in this work, crushed limestone up to the size of 2 in. being used as the coarser aggregate. Reinforcement consisted of ⅝-in. distorted iron rods placed 2 ft. apart vertically and ¾-in. rods spaced 12 to 16 in. apart horizontally.

On top the crew employed in wheeling and mixing the concrete consisted of seven men including the bell boy. This number was excessive and could have been reduced to four if the material had been placed close to the mixer. As the tipple was kept in daily operation, however, it was necessary to unload the concrete materials from railroad cars at a point from 100 to 250 ft. away from the mixer. Even under these circumstances, however, as many as 200 batches were sometimes placed in eight hours.

Within the shaft five men were employed. Two of these were engaged in spading the concrete behind the forms; the other three built the forms, placed the reinforcement, repaired the central wall and did like work. The placing of concrete was performed under somewhat adverse conditions, that is, be-

Cost of Placing Concrete in Shaft Lining—Months of August and July

Labor Costs Operation	Hours	Hourly Wage Rate	Total Labor Cost	Cost per Cu.Yd. Aug.	July
Building forms	176	@95c	$167.20	$0.90	$0.89
Spading concrete	130	@95c	123.50	.66	.78
Mixing concrete	62	@$1-$62	328.70	1.77	2.12
Mixing concrete	381	@70c-266.70			
Total labor			$619.40	$3.33	$3.79

Material Costs	Quantity	Price	Total Cost	Cost per Cu.Yd. Aug.	July
Cement	276.25 bbls.	@$3.30	$911.62		
Sand	81.4 cu.yd.	@ 3.07	249.89		
Limestone	162.8 cu.yd.	@ 2.50	407.00		
Reinforcement	3,000 lb.	@3c	105.00		
Total			$1,673.51	$9.04	$9.06

Summary				
Total cost of material per cu.yd.	Aug.	$9.04	July	$9.06
Total cost of labor per cu.yd.	Aug.	3.33	July	3.79
Total cost (labor and material) per cu.yd.		$12.37		$12.85

Total quantity of concrete placed, August 183 cu.yd.

tween the hours of 5:30 p.m. and 2:30 a.m. It was necessary to have the shaft in operating condition by 3 a.m., which was the time when the firebosses entered the mine to make their regular inspections. The work of concreting was nevertheless accomplished without interfering with the operation of the mine, or delaying it more than 30 min. during the entire job.

Some of the company officials questioned the quality of the concrete fearing that the aggregates would become segregated while being poured to so great a depth through a pipe so small as 4-in. diameter. It was demonstrated, however, that this did not impair in the least the quality or appearance of the finished concrete. The deflection box at the bottom of the pipe sprayed the concrete behind the forms where it was thoroughly spaded into place by the men stationed at this point. The concrete was mixed wet enough to allow its free movement into place behind the forms. This also resulted in a fine finish of the face because of the thorough spading.

The time that should be allowed for concrete so placed to set was somewhat of a question. It was demonstrated by actual experiment at a point 300 ft. below the shaft collar that when forms were removed 24 hr. after the pouring of the concrete, this material was quite solid. In pouring the lower portion of the shaft, therefore, only three sets of forms were used.

The accompanying table is a report of the labor and material costs during the month of August. It represents approximately the average cost throughout the entire operation of lining the shaft.

Relative Dangers of the Coal Seams of Pennsylvania

Studies have been made by R. N. Hosler, into the relative hazard of the coal seams of Pennsylvania. The details of this inquiry may be found in "Statistical Analysis of Coal-Mine Accidents in Pennsylvania—1916 to 1922 Inclusive," published by the Pennsylvania State Government at Harrisburg, Pa. Arranging the seams of the state according to the frequency of fatalities the results are as in Table I:

Table I—Ordinary Inside Fatality Rate Per Million Tons Production

Seam	Fatality Rate
(1) Sewickley	3.44
(2) Double Freeport	3.03
(3) Upper Kittanning	2.95
(4) Lower Freeport	2.77
(5) Clarion-Brookville	2.61
(6) Pittsburgh	2.47
All seams	2.47
(7) Lower Kittanning	2.29
(8) Upper Freeport	2.16
(9) Middle Kittanning	2.11

It will be seen that the Clarion and Brookville beds are classed together and that the Double Freeport is separately classified. It is interesting to note how the Pittsburgh and Lower Kittanning, the former considered a relatively dangerous bed and the latter a relatively safe one have by care in the one, possibly, and less care in the other become close neighbors in the column of hazards. Only 7,588,000 of Middle Kittanning coal was mined in the seven years as compared with 1,054,452,000 tons in the nine beds. The Middle Kittanning seam is the least hazardous and least mined of any.

The seams may also be arranged as to frequency of fatalities based on one thousand 2,000-hour workers, see Table II.

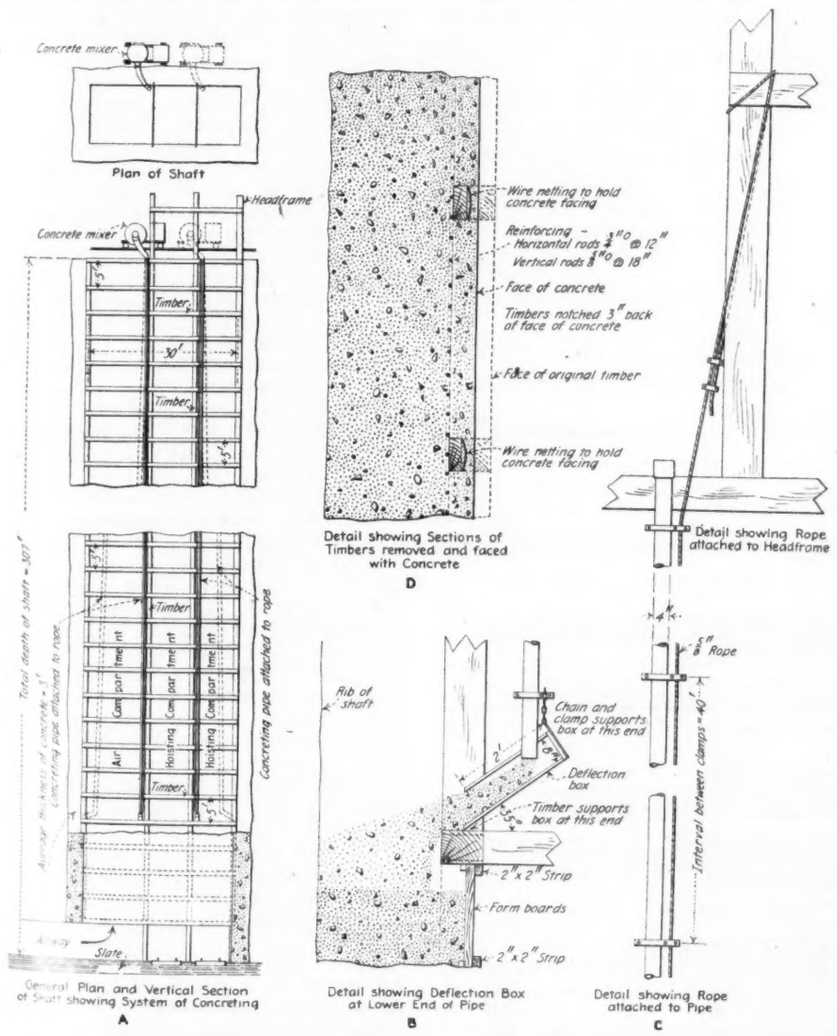
Table II—Ordinary Inside Fatality Rates Per One Thousand 2,000-Hour Workers

Seam	Fatality Rate
(1) Double Freeport	3.97
(2) Sewickley	3.64
(3) Upper Kittanning	3.22
(4) Pittsburgh	3.15
(5) Lower Freeport	2.85
All seams	2.83
(6) Upper Freeport	2.27
(7) Clarion-Brookville	2.26
(8) Lower Kittanning	2.21
(9) Middle Kittanning	2.14

The expression, "ordinary fatality" denotes a fatal accident that occurs to not more than a predetermined number of persons at any one time. It may be noted that the returns are to some extent of less value because they do not differentiate accidents from falls from those which occur from other causes, such as gas. A man working 250 days and eight hours each day will work 2,000 hours. That length of time has been chosen as the basis for computing Table II.

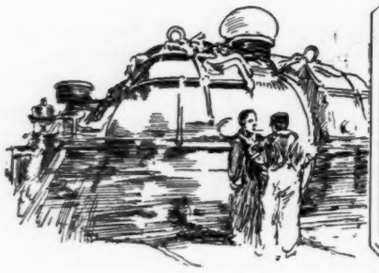
Light at the Working Face

Concentration of forces at the working face increases the need, and decreases the cost per ton, of supplying stationary electric lighting at the mine face or the roadways adjacent to it. Sam Mavor, of Glasgow, addressing the Mining Institute of Scotland, at Heriot-Watt College, Edinburgh, said that with the intensive system of mining in which coal cutters and conveyors were used jointly it was "not only practical but economical to light the working places." "It certainly," he added, "greatly facilitated the work in hand and in mines where open-flame lamps previously were used it contributed to the comfort and efficiency of the men." With more intensive mining the installation of a lighting system will come almost automatically as an indispensable adjunct to successful operation.

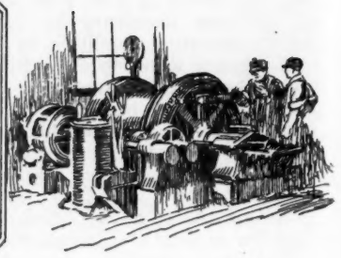


Method Devised for Concreting in Between Periods of Operational Activity

Concrete was mixed on the surface, spouted to a 4-in. pipe hung in the shaft by means of a wire cable, down which is flowed to a deflection box which shot it behind the forms. The pipe hung free in the shaft so that it was easy to pull it over from one side to the other, and thus to discharge the concrete wherever desired. Behind the forms the concrete was thoroughly spaded into place assuring a thorough mixture of the aggregates that may have become partially segregated during the long journey down the pipe.



Practical Pointers For Electrical And Mechanical Men



Deep Hole Drilling by Use Of Sectional Steel Rods

Much prospecting is now being done with rock drills and sectional drill steel. In 1916 a large western mining company drilled a 45-ft. horizontal hole by using 2-ft. sections of rod made from 1½-in. pipe; one piece being welded to a regular drill shank, the remaining sections having pipe threads on both ends. The necessary sleeves were provided for coupling the rods together as in ordinary pipe fitting, with the exception that the threads were cut to permit the pipe meeting end to end. Bit ends were threaded to fit the sleeves.

Later diamond-drill rod was used instead of pipe, and a water-connection swivel employed to introduce water directly into the rod, rather than through the rock-drill as previously, for it was found necessary to use rather high and direct water pressure to expel the cuttings from the deep drill holes.

Where hard rock was encountered it became necessary to use still heavier rod. The diamond-drill rod was abandoned and regular 1¼-in. hollow round drill steel used in its stead. To maintain the maximum section of the drill steel, it was necessary to upset each end of the rod to 2 in. in diameter and machine a taper male thread on one end with a corresponding female thread on the other. The rods were screwed together and in use they proved to be satisfactory mechanically, although the high-carbon drill steel was threaded in a lathe only with difficulty.

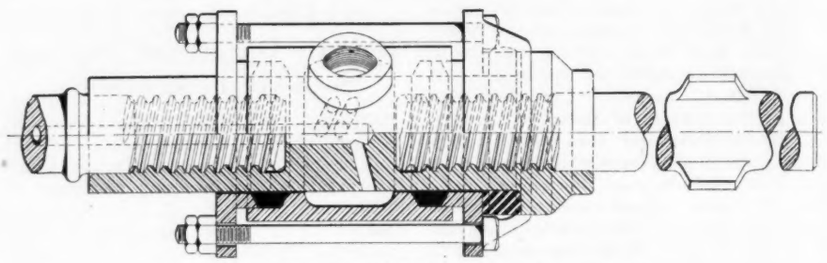


Fig. 2.—Swivel Used in Drilling Deep Holes

This swivel is part of the equipment used with drifting machines. When drilling deep holes, a thrust bearing is added to the swivel.

Present Drilling Practice

The present equipment conforms closely to that used in standard mine practice and consists of a rock drill, 3-in. single screw columns, arms and saddle, 1-in. air hose, ¾-in. water hose, drill bits, threaded drill rods, sleeves and water-connection swivel. These items, except the last three, are standard mine equipment.

The column should be placed so as to put the arm 4 ft. from the collar of the hole; this permits of a full 3-ft. run and allows room for the swivel. A good rigid set-up is markedly advantageous. The machine is then mounted in the conventional manner, except that as no water is passed through the machine, the water tube has been shortened by 2 in. and the common water spud is replaced by a plug. The water hose is connected to the water-connection swivel. A bit end is screwed into the swivel and drilling begins. The steel should be kept in alignment with the hole during the first 8 or 9 ft. of drilling. After the bit end is run out, the independent rotation on the machine is reversed and the joint unscrewed by the rotation mechanism, the bit end remaining in the hole. The machine is then cranked back and a 3-ft. drill rod is held between the swivel and the bit end in the hole and screwed up by the independent rotation running in its normal direction.

Drilling proceeds in this manner until the bit becomes dulled, whereupon the clamp of the saddle is loosened, the machine turned to one side and the rods withdrawn and disconnected. The second (3⅜-in.) bit end is screwed into a sleeve on a 6-ft. rod and placed in the hole. Additional 6-ft. rods are added until the bit reaches the end of the hole. Drilling is resumed, and 3-ft. rods are added as the hole progresses; when the second bit becomes dull, the change is repeated.

To date the breakage of drill rods has been almost negligible, but fishing tools have been developed whereby a broken section in the hole may be withdrawn.

In drilling holes slightly above the horizontal to a depth of from 50 to 75 ft., water under 70-lb. pressure will eject the cuttings satisfactorily, but when drilling deeper holes or holes below the horizontal, higher pressures must be used. These may be obtained by tapping the pump column, if there is sufficient head in the shaft, or by the use of a small high-pressure pump.

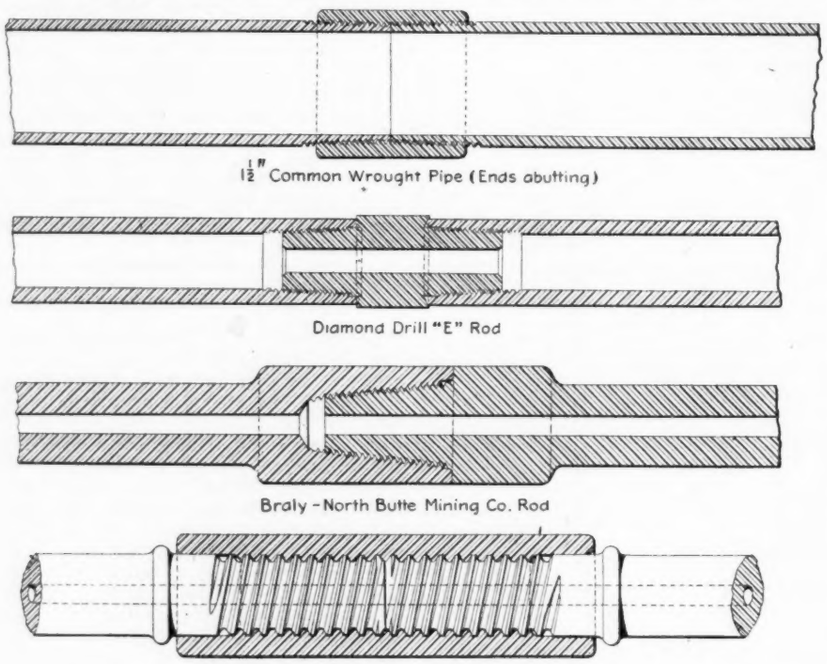


Fig. 1—How the Drill Joints Have Changed

From a simple pipe joint and sleeve coupling a new joint has been designed which makes the work of adding another section easy.

From 3 to 5 gallons of water per minute are required, depending upon the pitch of the hole and the hardness of the ground. When gravelly ground is encountered, it is sometimes necesary to blow out the holes, although this is not often required with 50-ft. holes drilled above the horizontal.

Care should be taken in coupling the rods to insure each rod meeting its fellow end to end. The sleeves are not expected or designed to transmit the energy which flows directly through the drill rods. This brings up the question, how the energy from the piston hammer is transmitted to the drill bit.

One hole was recently drilled to a depth of 227 ft. All the steel and couplings shown were used in the hole at one time and as the rods and couplings weighed about 900 lb., it is obvious that the entire rod was not moved by each blow of the 14-lb. piston hammer but rather that a flow of high-frequency vibrations was transmitted through the rod and was expended by the action of the drill bit against the rock. This is borne out by the fact that the drilling speed per minute on the last 50 ft. of this deep hole was practically the same as on the first 50 ft., the slowest rate of drilling being between the 75 and 100-ft. points.

Sectional drill rods can be used for purposes other than prospecting, particularly the draining of water courses and old workings ahead of development faces. Open-cut mining in quarries using deep holes will probably present a field for the new method.

It must be borne in mind that the depth of hole that can be drilled is limited by certain factors, the principal one being the wear on the gage of the drill bits, for it is evident that if each bit can drill but 1 ft. and only seven changes are available, the result would be a 7-ft. hole. However, under favorable conditions, 6 ft. or more can be drilled with each bit and, this being the case, deep holes can be drilled quite cheaply. The application in each individual case is a matter that must be decided by the mine management.

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Denver Rock Drill Manufacturing Co.,
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Get a Competent Engineer And Follow His Advice

Small coal companies which do not have elaborate organizations, too often accuse the engineer of being extravagant, set in his ways, and disposed to subordinate practice to theory. Almost every coal man admits that he needs civil engineers for underground surveying and map making, although there are still those remarkable souls who will stoutly maintain that they can set centers better with the naked eye and will continue to adhere to their judgment until their rooms run together and their entries fail to meet.

The mechanical or electrical engineer also has his moments of extreme popularity, usually when his knowledge is required to solve some difficulty which has suspended production. When the mine once more is running smoothly, should he suggest that something be purchased or done to prevent the recurrence of the trouble, he is likely to be informed that he is extravagant. The fact is that coal operators, in general, do not utilize their engineers properly when they have them.

ADVICE HAS SOUND BASIS

Whatever else one may say about the engineer he rarely makes a recommendation without having some basis of fact for his advice. The "practical" mining man often buys a piece of equipment because he runs into a persuasive salesman, or because it looks good, or more often because he has successfully used the product of the same manufacturer at another operation, although conditions at that plant may have been entirely different.

Reflect a moment on these facts. How many mine locomotives are selected after a study of the duty cycle disclosing the necessary weight, drawbar pull and speed needed to handle a certain number of cars per trip, and trips per day? How many cutting machines are chosen with cutter bars and cutter chains geared for a certain speed, so as to cut with the utmost efficiency the coal in which they are going to be used? How many mine fans are selected according to the actual volume of air required to be moved against the water gage as determined by a study of the actual resistance of the airways which they must ventilate? How many pumps are selected to meet definite conditions of capacity, head, etc., and are installed with proper pipe lines to give maximum efficiency?

One hundred per cent of our coal-mine equipment ought to be selected only after the facts mentioned above have been ascertained and considered. As a matter of fact, far less than 100 per cent of the machinery is thus selected, and the reason why conditions are not worse can be traced directly to the fact that a great percentage of the machinery belongs to a few large coal companies who fully realize the importance of proper selection.

A large part of the trouble with electrical equipment is that it has been poorly selected for the work it has to do, though most of the equipment that is being built today is capable of giving real service when properly applied.

Certainly in these days of enlightenment no coal operator need deny himself the privilege of actually knowing definitely what to expect from each piece of machinery he purchases or the satisfaction of being sure that under the circumstances he has made the right decision. If he would only realize it, careful selection and specification of machinery is the coal operator's protection against loss. Such care in selection would tend to make manufacturers more aggressive and would soon put off-standard products out of business, for there would be no sale for such material.

Many coal operators have been in business for years and really have never learned how to get efficiency out of their equipment. There are classes of machinery capable of being utilized to great advantage by the coal industry which nevertheless most operators view with disfavor simply because they were never given a fair chance.

The centrifugal pump is one of these. Where it can be used, a centrifugal pump possesses the advantage of low first cost, low cost for upkeep, economy of space and under certain conditions comparatively high efficiency. Furthermore, it is easy to say definitely, when a few facts are known, whether under certain conditions a centrifugal pump will prove satisfactory. Nevertheless, some operators are afraid of this equipment, and many operators condem it because they have been unable to force this sensitive machinery with its definite limits of performance to accomplish something physically impossible, though a rather rudimentary investigation would have made its proper function clear.

To cite a specific instance: A certain well-known and extremely capable coal operator was managing some mines for a large corporation in Pennsylvania, where there were some centrifugal pumps which had evidently been improperly applied. They never worked well and were taken out and scrapped and replaced by reciprocating pumps. This man firmly resolved never to have anything to do with a centrifugal pump.

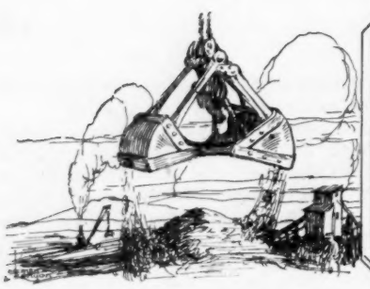
Later he moved to West Virginia. In one of the mines under his control was a pumping problem that gave much trouble. A certain body of water had to be kept down to a certain level to prevent it from flooding haulage roads. A reciprocating pump was being used and was extremely expensive as it was continually breaking connecting rods, crosshead guides, etc., as well as wearing out valves and water cylinders. As the pump was out of commission much of the time it always fought a losing battle with the water.

CENTRIFUGAL PUMP MORE EFFICIENT

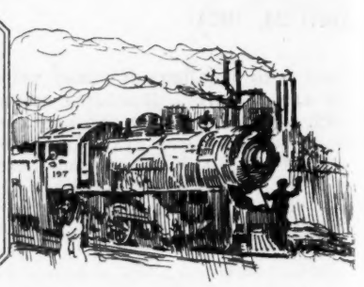
The operator was finally persuaded to replace this reciprocating unit with a centrifugal pump, which was carefully selected and properly installed. The result has been that with a pump, which cost about the same or less than the water end of the old pump, about three times as much water has been moved with only a 50 per cent greater expenditure of power. For a period of two years there has been practically no upkeep cost. About two hours was all that was necessary to figure out, check up, and make proper specifications for the pump to be used in this case.

If a company pays for advice it should test it at least once, and then if it does not give satisfactory results, stop paying for it. The engineer has a definite function in coal operation. With his education and experience and with his technical societies and publications to keep him up to date, he is bound to have a more complete knowledge of the subjects in which he specializes than anyone else. The operator should encourage the engineer to keep adding to this knowledge, and then when he needs it he should take advantage of it, realizing that he cannot himself efficiently fulfill his general functions and at the same time keep at his finger tips the details necessary to every branch of his work.

E. D. KNIGHT.
Charleston, W. Va.



Production And the Market



Inactivity Persists Throughout Coal Markets; Output at Low Level; Prices Still Falling

Inactivity is the prevailing condition in the coal markets of the country. From week to week there is little noticeable change either in demand or price, the general tendency being downward. The condition of the market is rather strikingly indicated by the bids received April 18 by the U. S. Shipping Board at New York for 1,065 gross tons of bituminous coal of either Pool 9 or 71 quality, the quotations ranging on a f.o.b. mine basis as low as $1.03 per net ton. Several railroads have signed up for fuel supplies for the coming year, but the closing of industrial contracts still leaves much to be desired, these consumers seeming to buy only for immediate requirements. There is no demand for tonnage for lake movement, and every indication points to a late start of the shipping season.

As the possibility of a strike of British coal miners grows more remote another possible source of business to the American coal producer is fading like a mirage. Nevertheless, one of the few bright spots in the trade was the export activity at Baltimore last week. On April 16 and 17 32,190 tons of cargo coal was loaded there for foreign countries and the total shipments during the first eighteen days of the month were only 2,000 tons less than those of the entire month of March. Italy continues to be the largest purchaser, with France second.

Coal Age Index declined 3 points to 169 as of April 21, the corresponding price being $2.04. This compares with $2.08 on April 14.

Demand for Steam Grows in Midwest

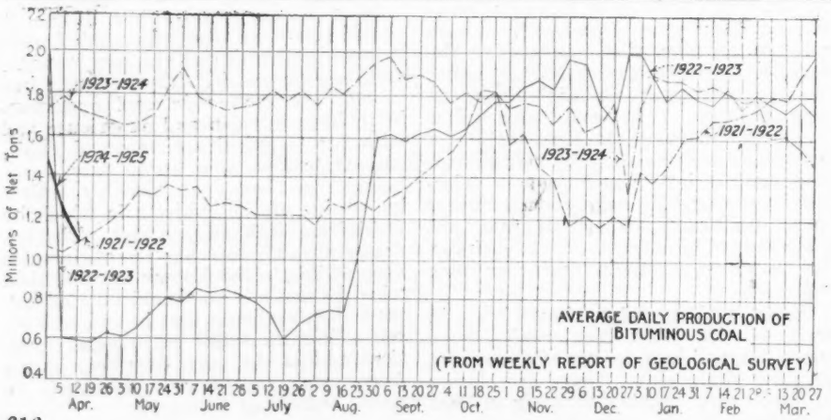
In the Middle West the demand for steam coal seems to increase a little each day, but the shortage of screenings consequent on the lessened production has not been sufficient to force prices up. Otherwise Midwest trade shows little perceptible change. Running time is low in all the Illinois fields, contracting being dull and the railroads still well fixed with supplies.

Demand is lacking from practically all sources in the Kentucky markets save for little buying by railroads, which are taking some tonnage to storage when they are not busy. Prices, however, are fairly firm all along the line. Northwestern markets seem to have hit the very bottom, sales and shipments from the docks being practically at a standstill. There are 3,250,000 tons of coal on the docks, of which 1,700,000 tons is free coal; the remainder is under contract but has not been accepted. Prices apparently are unchanged, but it is rumored that there is list cutting to obtain orders, so that another cut it likely. Stagnation reigns at Milwaukee. As the deadlock in wage negotiations continues at Kansas City, surplus coal supplies in the Southwest are nearing exhaustion, several large producers having ceased to quote prices. Warm weather has caused a slump in business in the Rocky Mountain region.

Ohio Markets Sink Further in Depths

Production in all Ohio fields is falling steadily with a continued lowering of demand, business at Columbus and Cleveland being lifeless. The market for slack at Cincinnati is better, but smokeless prices have softened. Pittsburgh has one of the dullest periods in its history except during a strike. Buffalo reports a slight improvement. Business is uniformly light throughout the New England and Atlantic seaboard markets from Boston to Birmingham.

Production of bituminous coal took a further drop of 84,000 tons during the week ended April 12, when 6,742,000 net tons was produced, according to the Geological Survey. Anthracite output was 1,856.000 net tons, an increase of 308,000 tons over the preceding week.



Estimates of Production
(In Net Tons)

	1923	1924
BITUMINOUS		
March 29	10,430,000	8,818,000
April 5 (a)	9,629,000	6,826,000
April 12 (b)	10,401,000	6,742,000
Daily average	1,734,000	1,124,000
Calendar yr. to date(c)	156,712,000	148,595,000
Daily average to date	1,788,000	1,698,000
ANTHRACITE		
March 29	2,008,000	1,942,000
April 5	1,602,000	1,548,000
April 12	2,067,000	1,856,000
Calendar year to date	29,537,000	26,805,000
COKE		
April 5 (a)	428,000	278,000
April 12 (b)	421,000	266,000
Calendar yr. to date(c)	5,506,000	4,205,000

(a) Revised from last report. (b) Subject to revision. (c) Minus one day's production to equalize number of days in the two years.

Midwest Wants Only Steam

The coal trade of the Midwest shows little change during the week, even though the demand for steam sizes grows a little each day. The shortage of screenings certainly will have to make itself markedly felt on the market some time soon with production as low as it is in every field, but that effect has not been strong enough yet to push prices high. Southern Illinois screenings have not yet climbed above $2.25. Much of that size brings only $2.10 and $2.15. One restraining influence is the Kentucky coal available at so much lower prices. However, the amount of this is much reduced by the April 15 strike in western Kentucky. Stocks of coal in striking Kansas are about exhausted, thus slowly removing another small competitor.

The Midwestern fields are getting very little running time and not enough big contracts have been made since April 1 to improve this situation. A few small contracts are about all that have been definitely sewed up yet, for railroads still have heavy tonnages on the ground and are dallying. In southern Illinois even the 50c. undercutting of the association operators by the independents and by the Jackson County and Du Quoin group of operators does not produce any spot-market business, so coal simply will not move at any price. Nearly all mines are idle.

Mt. Olive district mines are getting a day or two a week but they cannot move lump at $2.85 when Franklin County can be had for a little less. Railroad tonnage in this field is fairly good, however. The Standard field, as usual, is in the worst position of all the Illinois fields. Crushers are working on lump that will not sell at $2.25, so as to move the coal as screenings at $2.

The spring lull has hit St. Louis and everything is practically at a standstill. Some yards did not move one load out in the three first days of last week. The public is not buying early storage coal and there is no demand for current needs. Wagon load steam has practically dropped off entirely on account of a large number of plants using electricity for power and needing no heat. Country domestic demand has practically ceased, excepting a little for anthracite chestnut. Judging from the way operators are going after this business there is plenty of anthracite. Country steam is reported fairly active at points.

Kentucky Trade Is Slow

The general situation in Kentucky is anything but satisfactory to operator and jobber, due to lack of demand from all sources. Retailers are stocked to supply immediate demands, and with mild weather are not in the market. Industrial consumers, utilities, byproduct and other heavy

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

Low-Volatile, Eastern*	Market Quoted	Apr. 23 1923	Apr. 7 1924	Apr. 14 1924	Apr. 21 1924†
Smokeless lump	Columbus	$6.15	$3.35	$3.35	$3.25@$3.50
Smokeless mine run	Columbus	4.25	2.35	2.25	2.15@ 2.35
Smokeless screenings	Columbus	4.10	1.85	1.85	1.75@ 2.00
Smokeless lump	Chicago	6.10	3.10	3.10	3.00@ 3.25
Smokeless mine run	Chicago	3.85	2.10	2.10	2.00@ 2.25
Smokeless lump	Cincinnati	6.35	3.35	3.25	**3.25@ 3.50**
Smokeless mine run	Cincinnati	4.25	2.10	2.10	*1.85@ 2.25*
Smokeless screenings	Cincinnati	4.00	1.85	1.80	*1.50@ 2.00*
*Smokeless mine run	Boston	6.25	4.20	4.20	4.15@ 4.25
Clearfield mine run	Boston	2.75	2.05	2.05	*1.65@ 2.40*
Cambria mine run	Boston	3.35	2.45	2.55	*2.25@ 2.75*
Somerset mine run	Boston	3.15	2.10	2.35	*1.85@ 2.50*
Pool 1 (Navy Standard)	New York	3.85	2.85	2.85	2.75@ 3.00
Pool 1 (Navy Standard)	Philadelphia	3.95	3.00	3.00	2.75@ 3.25
Pool 1 (Navy Standard)	Baltimore	.....	.....	.....	.....
Pool 9 (Super. Low Vol.)	New York	3.10	2.20	2.20	2.00@ 2.40
Pool 9 (Super. Low Vol.)	Philadelphia	3.20	2.20	2.20	2.00@ 2.45
Pool 9 (Super. Low Vol.)	Baltimore	2.90	2.00	1.80	1.75@ 1.85
Pool 10 (H.Gr.LowVol.)	New York	2.50	1.85	1.85	*1.80@ 1.90*
Pool 10 (H.Gr.Low Vol.)	Philadelphia	2.55	1.85	1.85	1.70@ 2.00
Pool 10 (H.Gr. Low Vol.)	Baltimore	2.50	1.75	1.65	1.60@ 1.75
Pool 11 (Low Vol.)	New York	2.05	1.40	1.60	*1.40@ 1.65*
Pool 11 (Low Vol.)	Philadelphia	.....	1.50	1.50	1.30@ 1.70
Pool 11 (Low Vol.)	Baltimore	2.15	1.50	1.50	1.50
High-Volatile, Eastern					
Pool 54-64 (Gas and St.)	New York	1.85	1.50	1.50	*1.35@ 1.60*
Pool 54-64 (Gas and St.)	Philadelphia	2.20	1.55	1.55	1.45@ 1.70
Pool 54-64 (Gas and St.)	Baltimore	1.95	1.60	1.60	1.50@ 1.70
Pittsburgh sc'd gas	Pittsburgh	3.10	2.40	2.40	2.30@ 2.50
Pittsburgh gas mine run	Pittsburgh	.....	2.25	2.25	*2.00@ 2.25*
Pittsburgh mine run (St.)	Pittsburgh	2.00	1.85	1.85	1.75@ 2.00
Pittsburgh slack (Gas)	Pittsburgh	2.10	1.30	1.30	1.25@ 1.35
Kanawha lump	Columbus	3.75	2.55	2.55	‡
Kanawha mine run	Columbus	2.25	1.65	1.55	‡
Kanawha screenings	Columbus	2.40	1.30	1.20	‡
W. Va. lump	Cincinnati	3.85	2.25	2.35	*2.00@ 2.50*
W. Va. gas mine run	Cincinnati	2.50	1.35	1.30	1.15@ 1.50
W. Va. steam mine run	Cincinnati	2.50	1.35	1.30	1.15@ 1.50
W. Va. screenings	Cincinnati	2.25	.90	1.05	*1.00*
Hocking lump	Columbus	2.85	2.55	2.45	2.25@ 2.60
Hocking mine run	Columbus	2.00	1.65	1.60	1.50@ 1.75
Hocking screenings	Columbus	1.70	1.30	1.30	1.25@ 1.40
Pitts. No. 8 lump	Cleveland	2.90	2.35	2.35	2.00@ 2.75
Pitts. No. 8 mine run	Cleveland	2.15	1.80	1.80	1.75@ 1.85
Pitts. No. 8 screenings	Cleveland	1.95	1.30	1.30	**1.35@ 1.45**

Midwest	Market Quoted	Apr. 23 1923	Apr. 7 1924	Apr. 14 1924	Apr. 24 1924†
Franklin, Ill. lump	Chicago	$3.65	$2.85	$2.85	*$2.50@$3.00*
Franklin, Ill. mine run	Chicago	3.10	2.35	2.35	2.25@ 2.50
Franklin, Ill. screenings	Chicago	1.95	2.15	2.15	2.10@ 2.25
Central Ill. lump	Chicago	2.70	2.60	2.60	2.50@ 2.75
Central, Ill. mine run	Chicago	2.10	2.10	2.10	2.00@ 2.25
Central, Ill. screenings	Chicago	1.55	1.65	1.90	1.80@ 2.00
Ind. 4th Vein lump	Chicago	3.35	2.85	2.85	2.75@ 3.00
Ind. 4th Vein mine run	Chicago	2.85	2.35	2.35	2.25@ 2.50
Ind. 4th Vein screenings	Chicago	1.85	1.95	1.95	1.90@ 2.00
Ind. 5th Vein lump	Chicago	2.85	2.35	2.35	2.25@ 2.50
Ind. 5th Vein mine run	Chicago	2.10	2.10	2.10	2.00@ 2.25
Ind. 5th Vein screenings	Chicago	1.55	1.65	1.80	1.75@ 1.85
Mt. Olive lump	St. Louis	.....	2.85	2.85	2.75@ 3.00
Mt. Olive mine run	St. Louis	.....	2.50	2.50	2.50
Mt. Olive screenings	St. Louis	.....	1.50	1.50	1.50
Standard lump	St. Louis	2.50	2.35	2.35	2.25@ 2.50
Standard mine run	St. Louis	1.85	1.95	1.95	1.90@ 2.00
Standard screenings	St. Louis	1.10	1.20	1.20	**1.75@ 2.00**
West Ky. lump	Louisville	2.50	2.35	2.25	2.00@ 2.50
West Ky. mine run	Louisville	2.10	1.50	1.70	*1.50@ 1.75*
West Ky. screenings	Louisville	1.90	1.20	1.60	1.50@ 1.75
West Ky. lump	Chicago	2.60	2.60	2.25	2.00@ 2.50
West Ky. mine run	Chicago	1.80	1.10	1.60	1.50@ 1.75
South and Southwest					
Big Seam lump	Birmingham	2.50	2.60	2.60	2.50@ 2.75
Big Seam mine run	Birmingham	2.10	2.00	2.00	1.75@ 2.25
Big Seam (washed)	Birmingham	2.35	2.20	2.20	2.00@ 2.40
S. E. Ky. lump	Chicago	4.00	2.35	2.25	2.00@ 2.50
S. E. Ky. mine run	Chicago	2.85	1.60	1.60	1.25@ 2.00
S. E. Ky. lump	Louisville	3.85	2.60	2.60	*2.25@ 2.50*
S. E. Ky. mine run	Louisville	2.60	1.50	1.60	*1.25@ 1.75*
S. E. Ky. screenings	Louisville	2.20	1.05	1.25	1.15@ 1.35
S. E. Ky. lump	Cincinnati	4.00	2.35	2.25	2.00@ 2.50
S. E. Ky. mine run	Cincinnati	2.25	1.35	1.25	**1.15@ 1.50**
S. E. Ky. screenings	Cincinnati	2.10	.85	1.00	*.80@ 1.00*
Kansas lump	Kansas City	3.85	4.50	4.50	4.50
Kansas mine run	Kansas City	3.25	3.25	3.25	3.25
Kansas screenings	Kansas City	2.60	2.50	2.50	2.50

* Gross tons, f.o.b. vessel, Hampton Roads.

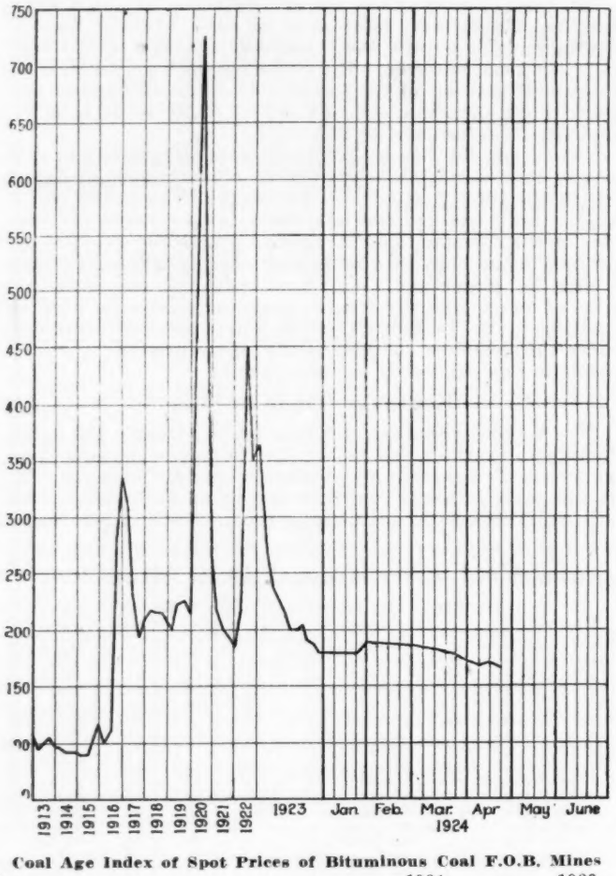
† Advances over previous week shown in **heavy type**, declines in *italics*.

‡ Strike on.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Freight Rates	April 23, 1923 Independent	April 23, 1923 Company	April 14, 1924 Independent	April 14, 1924 Company	April 21, 1924† Independent	April 21, 1924† Company
Broken	New York	$2.34	.....	$7.75@$8.35	.....	$8.00@$8.65	.....	$8.00@$8.65
Broken	Philadelphia	2.39		7.90@ 8.10		8.50@ 8.65		8.50@ 8.65
Egg	New York	2.34	$8.50@$10.50	8.00@ 8.35	$8.25@$8.65	8.25@ 8.65	$8.25@$8.65	8.25@ 8.65
Egg	Philadelphia	2.39	9.25@ 9.50	8.10@ 8.35	8.25@ 9.40	8.60@ 8.65	8.25@ 9.40	8.60@ 8.65
Egg	Chicago*	5.06	12.00@ 12.50	7.20@ 8.25	7.59@ 7.81	7.65@ 7.72	7.59@ 7.81	7.65@ 7.72
Stove	New York	2.34	8.50@ 10.50	8.00@ 8.35	8.25@ 9.00	8.25@ 8.85	8.25@ 9.00	8.25@ 8.85
Stove	Philadelphia	2.39	9.25@ 9.50	8.15@ 8.35	8.60@ 9.50	8.65@ 8.85	8.60@ 9.50	8.65@ 8.85
Stove	Chicago*	5.06	12.00@ 12.50	7.35@ 8.25	7.90@ 8.03	7.81@ 8.03	7.90@ 8.03	7.81@ 8.03
Chestnut	New York	2.34	8.50@ 10.50	8.00@ 8.35	8.25@ 9.00	8.25@ 8.75	8.25@ 9.00	8.25@ 8.75
Chestnut	Philadelphia	2.39	9.25@ 9.50	8.15@ 8.35	8.60@ 9.50	8.65@ 8.75	8.60@ 9.50	8.65@ 8.75
Chestnut	Chicago*	5.06	12.00@ 12.50	7.35@ 8.35	7.81@ 7.94	7.72@ 7.95	7.81@ 7.94	7.72@ 7.95
Range	New York	2.34		8.30		8.50		8.50
Pea	New York	2.22	6.30@ 7.50	6.00@ 6.30	4.50@ 5.00	5.50@ 6.00	4.50@ 5.00	5.50@ 6.00
Pea	Philadelphia	2.14	7.00@ 7.25	6.15@ 6.20	5.25@ 6.50	6.00	5.25@ 6.50	6.00
Pea	Chicago*	4.79	7.00@ 8.00	5.49@ 6.03	5.13@ 5.36	5.36@ 5.55	5.13@ 5.36	5.36@ 5.55
Buckwheat No. 1	New York	2.22	2.25@ 3.50	3.50@ 4.15	2.25@ 3.00	3.00@ 3.15	*2.25@ 2.75*	3.00@ 3.15
Buckwheat No. 1	Philadelphia	2.14	3.00@ 3.50	3.50	2.75@ 3.00	3.00	*2.75@ 3.00*	3.00
Rice	New York	2.22	1.75@ 2.50	2.50	1.85@ 2.00	2.00@ 2.25	**1.75@ 2.25**	2.00@ 2.25
Rice	Philadelphia	2.14	2.00@ 2.50	2.50	2.00@ 2.25	2.25	2.00@ 2.25	2.25
Barley	New York	2.22	1.00@ 1.50	1.50	1.50@ 1.75	1.50	1.50@ 1.75	1.50
Barley	Philadelphia	2.14	1.15@ 1.50	1.50	1.50	1.50	1.50	1.50
Buckwheat	New York	2.22	.....	1.60	.....	1.60	.....	1.60

* Net tons, f.o.b. mines. † Advances over previous week shown in **heavy type**, declines in *italics*.



Coal Age Index of Spot Prices of Bituminous Coal F.O.B. Mines

	1924			1923
	April 21	April 14	April 7	April 23
Index	169	172	171	231
Weighted average price	$2.04	$2.08	$2.07	$2.79

This diagram shows the relative, not the actual, prices on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States weighted first with respect to the proportions each of slack, prepared and run-of-mine normally shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke, 1913-1918," published by the Geological Survey and the War Industries Board.

takers appear to be buying only immediate requirements. There has been just a little railroad buying, however, as the Southern Ry. and a few others are starting to take a little tonnage and move it to storage when they are not busy.

Prices are quite firm all along the line. Western Kentucky screenings are now quoted at the mine-run basis, while nut has advanced to $2@$2.25 a ton. Large prepared such as egg, lump and block are slow, as there is no material market for these sizes, but the small stove size has a good Southern movement in the summer, and screenings are needed by consumers using automatic stokers. Early opening of lake movement is not expected by the coal trade, as the ice is late in getting out of the lakes and there is no demand in sight.

Northwest Dull as Can Be

The soft-coal market at the head of the lakes seems to have reached a period of inactivity from which there hardly can be a change for the worse. Docks are selling little or nothing and shipments are at a standstill except for the coal which railroad companies are taking out to enable the docks to work a few days a week, and so keep their crews together.

Official announcement of stocks on docks shows that there are now 3,250,000 tons of soft coal on the docks, of which 1,700,000 tons is free coal. The balance is under contract but has not yet been accepted. Prices are the same as far as coal men will admit, but it is whispered that one dock is cutting below list to obtain a few orders, and it is probable that another cut may come. To add to the pessimistic outlook it is predicted that there will be a 30-per cent cut in the ore output this year, which will mean less coal sold to the independent mining companies. For this reason the mining companies are not in a hurry to start operations and are not placing orders for fuel.

The coal market at Milwaukee continues flat and stale. Little is doing in either hard or soft coal. The latter is weak and almost unsaleable because of the promised May reduction. The cut of $1 to $1.50 per ton at the head of the lakes adds to the disinclination to buy at present prices. The weather continues warm, and the domestic coal-burning season is about over.

Little Doing in the West

While representatives of Southwestern district operators and miners in conference in Kansas City are deadlocked over a wage contract, surplus supplies of coal are being exhausted. Several large producers have ceased to quote prices. Jobbers are handling the product of some mines, independent of the operators' association, the operators of which have signed contracts renewing for three years the wage scale which expired April 1. For such coal of the Southwestern district as is available, the price remains unchanged. Kansas lump is $4.50; nut, $4; mine run $3.50 and screenings $2.50.

Warm weather throughout the Rocky Mountain region caused a considerable slump in the Colorado coal market during the past week. A number of additional mines among the less lucrative have been closed for the season. The mines worked on an average of about half time last week, the operators reporting about 28 per cent of the time lost on account of no market.

Mines in Utah are working about two days a week. Industries are buying little. The domestic demand is for slack, egg, nut and stove coal. The large sizes have become a drug on the market. There are many "no bill" cars of lump and domestic lump on the tracks just now. The labor situation is excellent and prices on small sizes remain firm.

Ohio Markets Still Sagging

Production continues to decline steadily in all Ohio fields. Demand for coal in the Columbus market has declined further, and with the continued reduction in demand throughout the state operators are closing down until market conditions improve. As a result loadings in the southern Ohio field have fallen below 10 per cent of capacity. Only a few operations having steam contracts or railroad fuel agreements are operating. Eastern Ohio is somewhat better off, but the output in that section is being reduced radically. Domestic trade is practically dead. Pocahontas is not in as good demand as formerly and Ohio-mined grades are dead. Steam business, which usually is the backbone of the market at this time, also is flat. There is practically no steam contracting, as users are buying what they desire in the open market. Railroad contracts have now been closed, and in most cases at extremely low quotations. There is now less distress coal on the market than was the case two weeks ago. Only occasional inquiries for lake contracts are heard and practically no contracting has been closed.

An appreciable betterment in the market for slack and softening in prices of smokeless are the high lights of the Cincinnati market. The slack situation was to have been expected but the other is not so easy to trace. For several weeks the demand for the residue has been a little stronger than production, and with the gradual clearing up of distress coal, it was only logical that screenings should be a little harder to get. Generally speaking the free movement is on a $1 basis, though there are some off grades from Kentucky that are selling 10 to 20c. cheaper. The big spread in the price of run of mine and block coal still continues. Here and there is an inquiry for 2-in. coal for lake shipment, but the full swing of this business has not started. River business has been cut down appreciably through the stoppage of mining in the K. & M. fields of the Kanawha district. Specialized coals are quoted as follows: Block, $2.75@$3.25; egg, $2@$2.50.

The "no market" situation, accompanied by 100 per cent transportation facilities throughout the country, and the lighter shipping of lake cargo coal due to the heavy stocks at the head of the lakes, has brought about extreme heaviness in the Cleveland market. Large consumers are still drawing upon stocks and the buyer who enters the open market at this time to supply his needs is not of such sig-

nificance as to have any salutary effect whatsoever upon the market. Inquiries for fuel are scarce and the negotiation of contracts for current coal year requirements are negligible.

The Pittsburgh market is perhaps the dullest on record, except for strike periods. Line consumers are buying scarcely any coal, depending on stocks and expecting lighter consumption. The steel industry has slowed down 10 per cent from the rate in early March. The lake season still lags. The lake shippers do not seem to be doing much even in the non-union fields.

Business at Buffalo is somewhat better, though some of the confirmed pessimists assert that the improvement is only in spots and that the general trade is unchanged.

New England Reports Light Trade

Only light tonnages are being placed in New England. Sales are confined for the most part, however, to relatively small lots forced on the market by factors who are obliged either to move demurrage coal or make room for arrivals. There are signs that this practice is less in vogue than a fortnight ago, and minimum prices are less heard from.

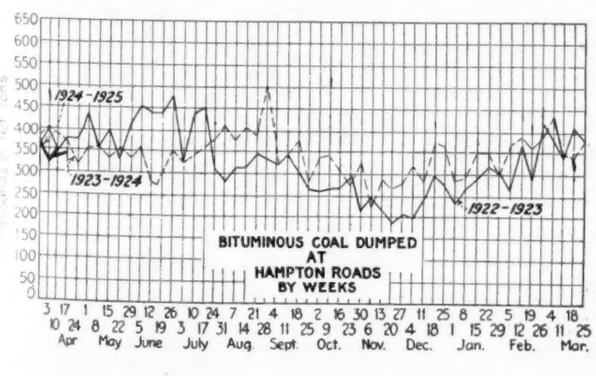
The Hampton Roads market shows the same indications. The volume of No. 1 and No. 2 grades on wheels has been reduced and spot prices are being more closely held at $4@$4.25, depending upon grade. Certain of the agencies say now that no No. 1 Navy Standard coal can be bought at less than $4.25 per gross ton f.o.b. vessel, and that statement probably is accurate as of this writing. In other words, there seems to be a firmer intention on the part of operators to curtail, and if held to long enough this policy would of course be effective.

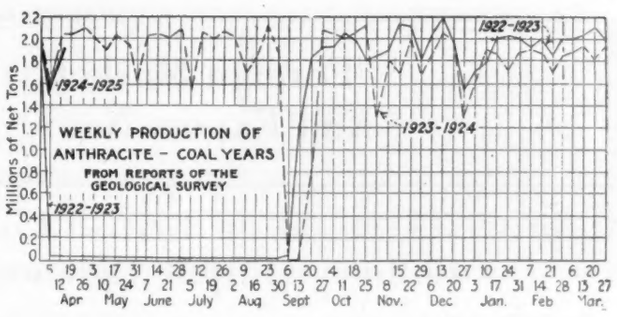
All-rail from central Pennsylvania there is no material change. An increasing number of producers are determined not to mine coal at prices below the dead line. Money lenders are naturally encouraging this attitude, and while the way to improved conditions is an uphill road for the present it is clear that only by a close-hauled policy on the part of a large number of mine owners that present extremely low prices can be eliminated. A considerable tonnage of railroad fuel has been placed during the past fortnight or two at prices ranging from $1.60 to $1.75 per net ton, f.o.b. mines. The railroads generally will make a large saving on coal purchases during the current season.

Seaboard Markets Dull but Hopeful

Less coal is coming to the New York tidewater market. The average daily number of cars at the local terminals during the week was about 1,250, compared with about 2,000 a few weeks ago. While the market is draggy and dull there are some bright spots discernible. With free coals shortening and consumers reluctant to part with their reserve stocks there is a feeling that conditions will improve gradually. Reports from northern New York indicate more industrial activity with increased consumption. The local tidewater market showed a little more strength toward the week, both as to demand and prices.

Trade at Philadelphia is dull, but hope still persists that it will improve, though there are no signs that it will very soon. The one pleased person in the entire trade is the consumer, who feels that he has the upper hand now and can replace much of the stock that he is burning up at less than it cost him. Yet even this is no inducement for prompt filling in of the gaps that he is making. Spot prices are unchanged, and even though the same prices have ruled for





months the buyer seems to think that they may go even lower.

Little change is noticeable at Baltimore except for a marked renewal of activities for export movement. Despite restriction of production in a number of the fields, under agreements and otherwise, the supply at this point seems to be keeping up with the demand, which is exceptionally light.

Extreme dullness prevails in West Virginia with spot buying at the minimum and the bulk of loadings for contract delivery. As a result there has been a material curtailment in both high- and low-volatile fields and many mines are idle. The only improvement affecting smokeless mines has been at tidewater, due largely to curtailed shipments from the mines to the piers. Foreign inquiries are more numerous, largely as a result of a discussion of British labor troubles. Prices at the piers have steadied a little, but they are still unusually low.

Coal buying is lagging in the Birmingham market, inquiries coming in slowly and comparatively little new business being booked, either in steam and domestic grades. It seems difficult to interest consumers to the extent of stocking, little reserve supply being carried in any quarter. Contracting is still in its early stages, consumers apparently being of the opinion that there is no cause for special hurry to provide for future requirements. Spot sales of domestic sizes are light, contracts having been entered into by the principal dealers. Little distress coal is in evidence.

Anthracite Demand Below Expectations

While domestic sizes of hard coal are moving in good volume there is no rush. Dealers are taking their quotas of company coal and the larger independent operators are moving their tonnage without difficulty, but the smaller mines are not finding business so easy. Demand is not up to expectations. The easy winter and the knowledge that the miners are working under an agreement that will not terminate until next year have made the consumer indifferent. Even the fact that present prices are only for the month of April has no effect on buyers. Stove coal leads in activity, closely trailed by egg, with chestnut bringing up the third position. Call for pea coal is fairly good. The continued strength of barley coal is the feature of the steam market. It is in good demand and together with rice is moving steadily. Buckwheat drags along slowly. Unseasonably cool spring weather at Philadelphia and Baltimore has helped the sale of domestic sizes in those cities, but steam coals are in a bad way.

Connellsville Coke Market Stagnant

The Connellsville coke market reflects the decreasing activity in the steel trade in general and the extreme stagnation of the pig-iron trade in particular. Production of beehive coke during the week ended April 12 was 266,000 net tons, according to the Geological Survey, a decline of 12,000 tons as compared with the previous week.

Car Loadings, Surplusages and Shortages

	Cars Loaded—All Cars	Cars Loaded—Coal Cars
Week ended April 5, 1924	862,096	123,220
Previous week	907,548	154,680
Same week in 1923	996,375	164,195

	Surplus Cars—All Cars	Surplus Cars—Coal Cars	Car Shortage	
April 7, 1924	278,724	159,438	551	.....
Previous week	248,301	135,976	364	.....
Same date in 1923	15,168	4,305	58,237	24,539

Foreign Market And Export News

Improved Outlook in British Coal Market; Colliery Output Rebounds

Operators and consumers are still having their difficulties in the Welsh market, though with an improved outlook for settlement of the miners' wage controversy there has been a slight slackening in demand. Most of the collieries are still heavily booked and have not yet caught up in deliveries. Buyers are fairly well stocked with supplies and the recent surplus of waiting vessels is less in evidence.

Home consumers are taking large quantities of coal so that in all there is little available for shipment abroad. There is considerable pressure for prompt supplies and prices are firm.

Heavy demands are being made by domestic consumers on the Newcastle market, especially for gas coals. Business with Europe has improved slightly, so that all the collieries are busy. Prices are firm.

A court of inquiry to investigate the miners' wage question has been named by the Ministry of Labor. Pending the outcome of the inquiry, the present wage basis will be continued. Elimination of the fear of a strike action and the Franco-German extension of the agreement regarding Ruhr coal deliveries are creating an easier tendency in the market and buyers are expecting lower prices.

A cable dispatch to *Coal Age* states that during the week ended April 5 the British collieries produced 5,852,000 tons of coal, according to the official estimates. This compares with an output of 5,745,000 tons during the week ended March 29.

Trade at Hampton Roads More Active; Prices Stiffen

Business at Hampton Roads is more active with considerable foreign movement and a stiffening in prices. Low stocks at tidewater added to the upward price movement.

Coal agencies reported that fully 40 to 50 per cent of the operations on the Chesapeake & Ohio, Virginian and Norfolk & Western had closed down temporarily because of overproduction.

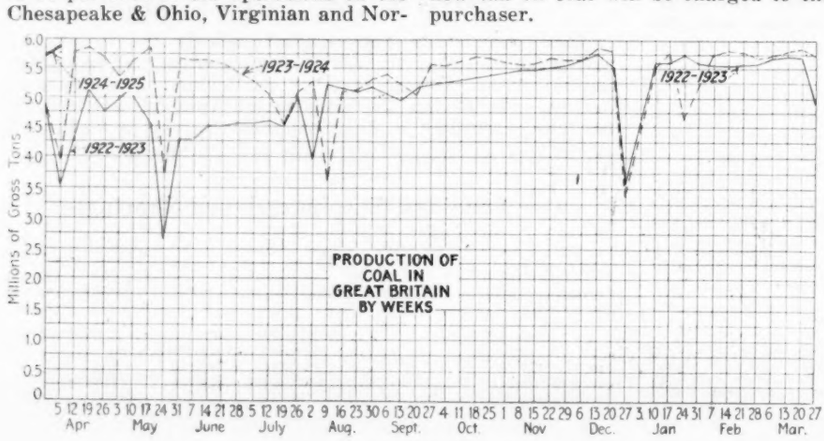
Coastwise movement is dull, old contracts having been used up and no disposition being manifest on the part of consumers to come into the market heavily at this time. The tone of the market is firm and the outlook for business bright.

Business in French Market Above Seasonal Level

With the continuance of cool weather, business in household fuel in French markets is more active than usual at this time of the year. Trade in industrial fuel also continues to be satisfactory. With the decline of sterling, there has been a revival of coal buying in England, including a few orders for Cardiff semi-bituminous grades, which had been rather neglected of late owing to their high prices.

Following the meeting in Paris of Belgian and French house-coal producers, the Belgians, who had expected an amelioration of their coal market in the absence of British competition, and who are now fearful of the results of a fall in sterling, have changed their attitude and are now starting to apply summer prices on the following basis: 8 fr. premium per ton on all shipments by water during April, and 8 fr. per ton on all shipments by rail and water in May.

The new tariff of the Nord and Pas-de-Calais collieries, dated April 1, provides for a reduction of 3 fr. in the price of coal, and 8 fr. on ovoids, the new prices being applicable in all selling zones. On sized products, summer premiums are not applicable on ovoids, dry unscreened 50 per cent, nor on bituminous screened 50 per cent, nuts 30/50; dry coal for gas engines washed forging peas or briquets. Prices will be modified in case of wage increases and all taxes, increase on taxes, or any new tax on coal will be charged to the purchaser.



In spite of summer premiums granted by collieries, Paris dealers have decided not to alter their retail market list until further steps are taken.

Receipts of indemnity fuels by France and Luxemburg during March from the Ruhr were close to 1,000,000 tons.

Export Clearances Week Ended April 18, 1924

FROM BALTIMORE

	Tons
For France	
Belg. Str. Gasconier	7,456
For Porto Rico	
Amer. Str. Major Wheeler	632
For Italy	
Ital. Str. Ignazio Florio	7,398

FROM HAMPTON ROADS

For Brazil	
Br. Str. New Brunswick for Rio de Janeiro	8,011
Br. Str. Lady Astley for Rio Janeiro	4,082
Br. Str. Marie De Larrinaga for Rio Janeiro	4,800
For Canada	
Amer. Str. Harvey H. Brown for Halifax	4,021
Amer. Schr. Dorothy for Yarmouth, N. S.	1,145
For France	
Fr. Str. Capitaine for Ouessant	6,157
Br. Str. Lancaster Castle for Brest	7,683
For Italy	
Amer. Str. Middlesex for Genoa	7,559
Amer. Str. Hampden for Genoa	7,532
Ital. Str. Lodovica for Trieste	626
Ital. Str. Cerea for Genoa	4,874
For Uruguay	
Nor. Str. Hesperos for Montevideo	6,505
For West Indies	
Nor. Str. Bratland for Curacao	3,000
Nor. Str. Skogheim for Fort de France	3,888

FROM PHILADELPHIA

For Cuba	
Dan. Str. Nord Amerika for Havana	

Hampton Roads Pier Situation

	April 10	April 17
N. & W. Piers, Lamberts Pt.:		
Cars on hand	1,546	1,473
Tons on hand	91,081	87,456
Tons dumped for week	126,711	118,343
Tonnage waiting	18,000	23,000
Virginian Piers, Sewalls Pt.:		
Cars on hand	1,366	861
Tons on hand	105,800	58,950
Tons dumped for week	106,452	106,808
Tonnage waiting	962	.....
C. & O. Piers, Newport News:		
Cars on hand	1,450	948
Tons on hand	72,865	48,325
Tons dumped for week	70,670	86,219
Tonnage waiting	1,390	575

Pier and Bunker Prices, Gross Tons

PIERS

	April 12	April 19†
Pool 9, New York	$4.50@$5.00	**$4.65@$4.90**
Pool 10, New York	4.25@ 4.75	**4.40@** 4.75
Pool 11, New York	4.00@ 4.50	**4.25@** 4.50
Pool 9, Philadelphia	4.80@ 5.20	**4.80@** 5.20
Pool 10, Philadelphia	4.55@ 4.90	**4.55@** 4.90
Pool 11, Philadelphia	4.35@ 4.65	**4.35@** 4.65
Pool 1, Hamp. Roads	4.25@ 4.35	**4.35@** 4.45
Pool 2, Hamp. Roads	4.00@ 4.15	**4.15@** 4.25
Pools 5-6-7 Hamp. Rds	4.00@ 4.10	**4.00@** 4.15

BUNKERS

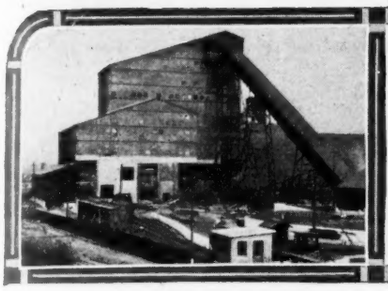
Pool 9, New York	4.80@ 5.30	**4.95@** 5.20
Pool 10, New York	4.55@ 5.05	**4.70@** 5.05
Pool 11, New York	4.30@ 4.80	**4.55@** 4.80
Pool 9, Philadelphia	5.10@ 5.55	5.10@ 5.55
Pool 10, Philadelphia	4.90@ 5.20	**4.90@** 5.20
Pool 11, Philadelphia	4.65@ 5.00	**4.65@** 5.00
Pool 1, Hamp. Roads	4.25@ 4.35	**4.45**
Pool 2, Hamp. Roads	4.00@ 4.15	**4.25**
Pools 5-6-7 Hamp. Rds	4.00@ 4.10	**4.00@** 4.15

Current Quotations British Coal f.o.b. Port, Gross Tons

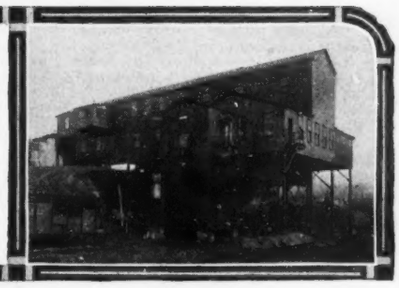
Quotations by Cable to *Coal Age*

	April 12	April 19†
Cardiff:		
Admiralty, large	31s.	*30s.@31s.*
Steam smalls	22s.6d.@23s.6d.	**23s.6d.**
Newcastle:		
Best steams	27s.@27s.6d.	27s.@27s.6d.
Best gas	25s.6d.	25s.6d.
Best bunkers	24s.6d.@25s.	**25s.**

† Advances over previous week shown in **heavy type**, declines in *italics*.



News Items From Field and Trade



ALABAMA

A. B. Aldridge and associates have purchased from the Sloss-Sheffield Steel & Iron Co., 18,000 acres of coal lands in Walker County, 40 miles west of Birmingham, for a consideration said to be between $300,000 and $400,000. This acreage is adjacent to land being worked by Mr. Aldridge and associates in supplying coal to the Alabama Power Co. for its big thermo-electric plant on the Warrior River.

The Pratt Consolidated Coal Co. recently completed a small slope at Mineral Springs, near Birmingham, and installed a washing plant for the preparation of the coal.

The No. 2 coal mine of the **Alabama Company,** at Lewisburg, has reached a depth of around 1,600 ft. and will soon be producing coal in quantity. Contracts have been let for a washery and other modern equipment for the mining and preparation of the coal. It is expected to push the production of this slope to around 2,000 tons daily ultimately, supplementing the production from old No. 1 mine located about a mile distant from the new opening.

The Roden Coal Co. recently installed concentrating tables and dewatering process for the better preparation of its output at Marvel mine, in Bibb County.

Moss & McCormack are doing some prospecting work and making **preliminary plans for the development of the large tract of coal lands** in Fayette County leased from the federal government some months ago. There is 1,840 acres in this tract, which carries several seams of workable coal, the most valuable and extensive of which is the Jagger seam.

The Gulf States Steel Co. is contemplating the sinking of a new slope and airway at its Virginia coal mines near Bessemer.

The new slope of the **Bankhead Coal Co.,** recently reported, is expected to begin producing coal about June 1. A steel tipple and rotary dumps are being installed and the spur track is about completed. The mine is located at Bankhead, Walker County, the Mary Lee seam being mined.

The Bush interests have recently made **additions to their coal-washing plants** at Majestic, Bradford and Dixiana, practically doubling the capacity. The output of these mines is used principally in the by-product ovens of the Alabama By-Product Corporation, at Boyles.

ILLINOIS

Herbert E. Bell, of the Bell & Zoller Coal Co., of Chicago, operators of the two big Zeigler mines in southern Illinois, **is about to erect a 23-story office building** on Michigan Boulevard, in Chicago. **R. H. Zoller,** vice-president and general manager of the same coal company, a short time ago opened the **Lake Shore Drive Hotel,** 181 Lake Shore Drive, Chicago, a luxurious eighteen-story hotel fronting on Lake Michigan.

In spite of demoralized conditions in the coal industry, **Peabody mine No. 6,** near Springfield, made a record hoist one day recently, when it **raised 3,717 tons of coal in eight hours,** breaking the former record made May 23, 1923, when 3,225 tons was hoisted. A check of figures showed that 1,601 pit cars were hoisted, filling seventy-nine railroad cars.

The Springfield District Coal Co. has purchased about 400 acres of land at from $75 to $100 an acre.

KANSAS

Despite the cessation of work in the mines Kansas miners are going ahead with preparations for the **state first-aid meet to be held in Arma on May 17.** In addition to the state forces C. E. Saxon and P. E. Keegan, of the Bureau of Mines, are conducting a number of training classes.

Alex Howat, who was booted out of the union for calling an unauthorized strike two years ago, **must go back to work in the mines in order to get back into the union.** This was the word he got from international headquarters of the union at Indianapolis early this month when his case got a sort of hearing. James Harvey, member of the district board in Kansas reported that Howat was informed he was not put out of the union for life but that he must get back by exactly the same route that any other member must follow.

Certificates of completion of 12-week courses conducted under the Smith-Hughes act were presented to more than 150 Kansas miners at their **"commencement" in the Kansas State Teachers College** of Pittsburg the night of April 9. The men took work in mining, electricity and allied subjects. More than twenty classes were conducted at night in camps throughout the district by instructors of the Teachers College or miners who had been previously trained by the college. Charles F. Spencer, president of the Southwestern Interstate Coal Operators Association, was the principal "commencement" speaker.

The Cherokee Fuel Co. has been purchased by the Sinclair Coal Co., effective May 1. Both are selling agencies with offices in Kansas City, Mo., and Pittsburg, Kan. All the business will be conducted under the Sinclair company. The Cherokee has been handling the output of the Carbon Coal Co. and of the J. R. Crowe Coal & Mining Co.'s Kansas mines. The Crowe company itself sells the output of its Oklahoma mines. E. E. Trotter, Kansas City, sales manager for the Cherokee, will be retained by the Sinclair.

John H. Crawford, presiding judge of the **Kansas Court of Industrial Relations, has announced that that body will take no hand in the cessation of coal-mining operations in Kansas.** Two weeks after the general stoppage of work found more than 500 cars of coal on the tracks in the Pittsburg field awaiting orders. Under these circumstances no emergency exists, the public welfare is not affected and there is no occasion for the court to intervene, Judge Crawford said.

Attorney General C. B. Griffith of Kansas has given Judge J. H. Crawford of the Industrial Court an opinion that **the state mine inspector should pass an examination** and be granted a certificate by the State Mining Examining Board before qualifying to hold the position. **Leon Besson** assumed the position of inspector April 1 without meeting this requirement. Crawford has checked the matter up to the two members of the court, who made the appointment over his protest, and if they do not act it is probable that mandamus proceedings will be instituted by the Attorney-General to compel the inspector to take the examination.

The Central Coal & Coke Co. and the Pittsburg & Midway Coal & Mining Co. have recorded leases on several hundred acres of land in Labette County, near Edna, thirty miles west of the developed Crawford-Cherokee County field. All land within a radius of several miles of Edna is now under lease as well as the entire south portion of Labette County from Edna east of Chetopa. This land is contiguous to large tracts in Oklahoma on which the Central has taken leases within the last two or three years. The Labette County land has been leased for about $35 an acre with a damage clause calling for $75 an acre for land used in mining operations. The coal, which is 250 to 425 ft. below the surface, is said to have been shown by drilling to be from 4 ft. to 8 ft. thick and to be shiny black coal of high fuel value. This field is served by the Missouri-Pacific, M. K. & T., and Frisco railroads.

The Valentine Coal Co., capitalization $60,000, has been granted a Kansas charter. It has holdings near Pleasanton, Kan., and Worland, Mo., where John Valentine, manager and heaviest stockholder, has operated shovel mines for some years. The main office will be in Worland. **The Kabonic & DeGasperi Coal Co.,** capitalized at $6,000, also has been granted a Kansas charter. It is a consolidation of the Kabonic Coal Co. and the DeGasperi Brothers Coal Co., operators of small shaft mines in Crawford County. Its office will be in Frontenac.

The Missouri-Kansas Coal Co., with offices in Kansas City, Mo., has leased for six months, with a purchase option, a shaft mine at McCune, which had been operated for a year by the Osage City Labor Exchange. This is a machine mine and had been handicapped by inadequate electric service, which recently was remedied.

KENTUCKY

E. L. Douglass and John W. Ritchie were appointed receivers for the mining properties of **Jewett, Bigelow & Brooks** in Kentucky at a hearing before Judge A. M. J. Cochran in the U. S. Court for the Eastern District of Kentucky sitting in Covington on April 15. This action was taken on the demand of several of the creditors not satisfied with the progress being made under the creditors committee appointed late in January. Default on payments to the Harvey Coal Co. of Knoxville, Tenn., former owners of one of the mines of the company also caused action from that quarter. The assets of the company have been estimated at $5,000,000 by accountants and the financial troubles date back about three years, as told at the time that the creditors committee was formed. Separate action was filed against the Hazard-Jellico Coal Co. because a different set of owners were involved. Mr. Douglass has had direction of the J.B.B. mines for several years and Mr. Ritchie hails from Cincinnati and is the head of the Credit Men's Association there and skilled in the direction of receiverships.

The Deance Coal Co. is soon to build a substation in Happy.

The Chickasaw Coal Co. has been incorporated in Madisonville, with a capital stock of $25,000, by James D. Overall, J. Basil Ramsey and others.

A voluntary petition in bankruptcy has been filed in federal court by the **Drakesboro Coal Co.,** Drakesboro, Muhlenberg County, listing its liabilities at $13,197, of which $13,105 represents unsecured claims and its assets at $11,080, of which $10,000 represents property.

MISSOURI

One hundred miners employed by the **Madison County Coal Co.** have petitioned for a receiver for that company to be appointed by the Circuit Court of Madison County at Edwardsville. The miners in the petition contended that the company was unable to meet a payroll of $13,000. Thomas R. Harris, of St. Louis, is president of the company. Slow collections are said to have caused the company embarassment.

NEW YORK

The Mahoning Coal R.R., a subsidiary of the New York Central system, has declared a dividend of 20 per cent on the common stock, payable May 1 to holders of record April 17. A similar dividend was paid on Feb. 1. Patrick E. Crowley has been elected president and a director of the company, to succeed A. H. Smith.

The Atlas Powder Co. announces the removal of its New York Office from the Fifth Avenue Building, 200 Fifth Avenue, to the Park-Lexington Building, Park Avenue and 45th Street, the new phone number being Murray Hill 1411.

John M. Davis, president of Manning, Maxwell & Moore, and George B. St. George, president of the St. George Coal Co., have been **elected directors of the Coal and Iron National Bank**, Liberty and West Streets, New York City. They succeed John L. Kemmerer, of Whitney & Kemmerer, and Henry Maynard of the Central Railroad of New Jersey, who resigned.

In its annual printed report for 1923 the **Delaware, Lackawanna & Western R.R.** reports net income of $12,378,001, equivalent to $7.09 per share on the $87,277,000 of capital stock of $50 par value outstanding. In 1922 net income was $10,475,929. These figures agree with the preliminary report already published.

The Peerless Anthracite Co., of Buffalo, has gone into involuntary bankruptcy. It was established some months ago by H. L. Snyder, of Buffalo, but has not been in

E. J. Berwind, president of the Berwind-White Coal Co., has retired from the directorate of the Erie R.R. active operation lately.

The Akron Coal Co., of Akron, Ohio, announces the opening of a sales office at 872-74-76 Ellicott Square, Buffalo, in charge of J. Fred Morlock.

The C. P. Brodhead Coal Co., Inc., will be located May 1 in the Cunard Building, 25 Broadway, New York City.

OHIO

The Columbus Board of Purchase has awarded the contract for 10,500 tons of Hocking nut, pea and slack to the Sunday Creek Coal Co., of Columbus, at its bid of $1.45 at the mines. The freight is $1.26, making the coal cost $2.71 delivered. The coal is to be used by the municipal light plant, waterworks department and garbage department.

The Chauncey mine, near Athens, is preparing to start operations after an idleness of several months.

The Northern Fuel Co., Columbus, recently chartered, has been organized by the election of H. H. Heiner, formerly president of the Maynard Coal Co., as president, and H. H. Heiner, Jr., vice-president and secretary. Offices have been opened in the Guarantee Title & Trust Building. H. H. Heiner, Jr., will have charge of the Toledo office, which is located in the Nasby Building. The company will wholesale all kinds of coal and has obtained connections with several large operations in West Virginia and Kentucky.

The Goat Hill Coal Co., Bergholz, has been chartered with an authorized capital of 5,000 shares, no par value, designated to mine and buy and sell coal. Incorporators are Harry D. Eynon, John J. Davis, Delmer Johnson, John J. Freed and John C. Amstutz.

The Boone Coal Sales Company long established in the Dixie Terminal Building, Cincinnati, have joined the rapidly growing colony in the new Frederick H. Schmidt Building.

The Norwood School contract was closed on April 14 with Henry Feldman, of Cincinnati, as the successful bidder. There were eleven firms that put in bids for the business, which called for smokeless coal and the range of prices was from $4.85-$6 delivered to the schools.

A meeting of the creditors of the **Maynard Coal Co.**, which has been in the hands of receivers Frank L. Stein and William S. Harman for several months, was held in Columbus April 8, to discuss the possibility of reorganizing the concern. Several plans were proposed for a reorganization so that the receivership could be lifted. A committee of creditors consisting of Messrs. Fox and Meiner of Chicago, bankers, and Fred Essex, a coal operator of Columbus, was named to canvass the situation and report at a meeting to be called later.

Eugene Dubuis, who has been manager of the Columbus office of the Philadelphia & Cleveland Coal Co. for the past two years and previously traffic manager of the same company, has resigned to go with the Consolidated Mining Co., No. 8 East Broad St., in the sales department. H. S. Brown, Cleveland, has been named manager of the Columbus office in his place.

The Pittsburgh & Bessemer Coal Co., of Columbus, has been named exclusive agent in Ohio and northern territory for the product of the Boone County Coal Corporation, of West Virginia. In order to enlarge its sales department D. D. Davidson, formerly connected with the Gibraltar Coal Co., has become associated with the Pittsburgh & Bessemer Coal Co.

PENNSYLVANIA

The Philadelphia & Reading Coal & Iron Co. and the Lehigh Coal & Navigation Co. have awarded **contracts for anthracite stripping operations near Pottsville**, in the Mammoth vein, said to be one of the largest in the world, reaching a thickness of 100 ft. in some places. The Philadlephia & Reading will open thirteen mines on Locust Mountain from Ashland to Shamokin, the Lehigh contract being for operations on land controlled by one of the company's subsidiaries. It is expected that more than 4,000,000 cu.yd. of earth and stone will be removed in the latter operation and that about six years will be required for its completion. An electric shovel weighing 38 tons will be used.

Effective April 1st, the **Pittsburgh Steel Co.** began operating its coal and coke operations under the name of the **Monessen Coal & Coke Co., instead of the Pittsburgh Steel Co.**, as heretofore. The company's operations are Alicia No. 1, near Brownsville, in Fayette County, consisting of a large shaft mine, 400 rectangular coke ovens, coke screening and storage plants, with both river and rail loading facilities, machine shop and marine way, and Alicia No. 2, in Greene County about twenty miles up the Monongahela River from Brownsville, consisting of a large coal mine with both river and rail loading facilities.

The property of the **LaBelle Coke Co.**, at LaBelle, Fayette County, on the Monongahela River and the Monongahela Ry., which has been held under lease by the Peabody interests of Pittsburgh, is being taken back by the owners, the LaBelle Iron & Steel Co. The plant, consisting of 200 beehive ovens and a mine, has been idle since the middle of last month, due to refusal of the employees to work for reduced wages. The employees have not been paid since the mine ceased operations, and on April 1, the company store and office were completely destroyed by fire, thought to have been of incendiary origin. The LaBelle Iron & Steel Co. is a subsidiary of the Wheeling Steel & Iron Corporation.

A state charter has been issued to the **Daugherty Mining Co.**, to acquire coal lands and develop and operate them, with a capital stock of $15,000. The incorporators are Percy M. Willis, Hendersonville, treasurer; Henry C. Daugherty, Finleyville, and Jesse C. Bortz, Hendersonville.

In order that the company can perform two operations at one ston, the **Baltimore & Ohio R.R.** has purchased 23 acres of land at the Yoder coaling station, at Myersdale, on which the company **will construct a twenty-three acre storage dam** for water for engines and erect a watering station in connection with the coaling station. The dam will impound a large body of unpolluted water, suitable for steaming purposes.

The Jeddo-Highland Coal Co., will begin work soon on a new stripping operation in the Lehigh region. A mining village now occupies the site that will be worked.

Elmer O. Long, formerly of the engineering department of the Consolidation Coal Co., has resigned to accept the position of superintendent with the Listie Quemahoning Coal Co., having charge of four mines in Somerset County.

UTAH

Utah loses all title to school section land in Kane County, township 40 south, range 8 west by a decision just handed down by Eli F. Taylor, U. S. register of the land office. The Government contested the title on the ground the land was known to contain coal before the state's title attached. Section 2 in township 41 south, range 9 west, is retained by the government in the same action. Kane County is well provided with coal lands though they have never been developed as they have in Carbon County.

The cost of state inspections of coal mines in Utah, according to the Utah Industrial Commission, was less per million tons of coal mined in 1923 than in Wyoming, Colorado or Washington, being but $550 for every million tons of coal mined during the year.

The Great Western Coal Co., which filed leases on coal lands in Gordon Creek, Carbon County, was the successful bidder at the auction for the leases last week. A minimum of 27,000 tons annually must be mined by the company and $45,000 must be expended on development in three years.

WEST VIRGINIA

The Wheeling Steel Corporation, Wheeling, is planning one of the largest coke-manufacturing plants in its section of the United States. The company's present plant across the river from Steubenville, Ohio, is to be increased. Ground has been broken and several hundred men are at work on this project. More ovens will be built and the present construction of the plant will be changed, as the plant is now working at capacity, but is unable to feed all of the corporation's furnaces. The company also will have one of the largest industrial railroad yards in the Ohio Valley to handle cars used for raw and finished products.

The Sterling Island Creek Coal Co. is the name of a new concern organized with a capital of $25 000 to produce coal in the Logan County field. Among those interested in this company are W. L. Taylor, of Logan; W. T. Spicer, Molly Spicer, B. T. Spicer and Eddie Cameron, of Stollings. The company's general office is to be at Stollings.

G. H. Nowlin, Jr., of Lynchburg, has resigned as president and treasurer of the Smith Pocahontas Coal Co., effective April 1. The Smith Pocahontas Coal Co. operates mines at Caloric, W. Va., the general offices of the company being at Lynchburg.

The Cleveland-Morgantown Coal Co. has purchased 1153 acres of Sewickley coal in the Cass district of Monongalia County from Allison S. Everly and wife. The consideration was $46,316. Henry A. Phillips has purchased 64½ acres of Pittsburgh coal in Clay district of the same county, the consideration being $11,448.

Robert Talbott, well known in Fairmont coal circles, and his associates have just organized two new coal companies. One of them is to be known as the Talbott Fuel Co. and is capitalized at $450,000. Interested in it are Robert Talbott, J. Paul Talbott, Robert Talbott, Jr., H. Glenn Hood and C. A. Hannah, all of Fairmont. The other new Talbott concern is to be known as the Robert Talbott Co. also with offices at Fairmont. This company is capitalized at $350,000, the same people being incorporators.

James E. Barnes has resigned as second vice-president and district sales manager of the Logan Fuel Co. He had been in charge of the Dayton office of the company. Mr. Barnes had been active in the coal industry for the last 20 years. It is stated that Mr. Barnes will devote the greater part of his time in the future to the Dayton Standard Scale Co., of which he is general manager.

The Harlan Ashless Coal Co., of North Fork, has just been launched with a capital stock of $150 000, the general office to be at North Fork. This company was organized to operate in McDowell County on an extensive scale. Largely interested in the new company are Abe Forman, of Kimball; Harry Totz and W. S. Ray, of North Fork; M. H. Clark and P. G. Haines, of Welch.

WASHINGTON, D. C.

The appeal of James C. Davis, Director General of Railroads, **against Dexter & Carpenter, Inc.**, was sent April 14 by the U. S. Supreme Court **to the Circuit Court of Appeals for decision.** This involves a suit by Dexter & Carpenter for additional compensation for coal seized in the name of the Director General just prior to the coal strike of 1919 and used in the operation of the Baltimore & Ohio R.R. The coal from West Virginia mines, was en route to Baltimore for export when seized. The Director General paid the company the mine cost of the coal. The company sued for additional reasonable compensation. The District Court decided against the company, but the Circuit Court of Appeals reversed this and the District Court then awarded $27,264. It was from this that an appeal to the Supreme Court was taken. The high court decided that the Circuit Court of Appeals should pass upon the award.

CANADA

The Eastern Coal Dock Co., Ltd., of Montreal, with a capital of $50,000, has been incorporated to manage dock properties and carry on business as coal dealers by Edward W. Wright, John B. Allen and D. J. Nickle, all of Toronto.

Traffic News

To Reopen New England Rate Division Case

Announcement was made in New York on April 14 that the Interstate Commerce Commission will on May 12 reopen the New England rate division case.

The roads that will lead the fight for a modification of the terms of this decision are the Central Railroad of New Jersey and the Delaware & Hudson, but it is expected that numerous other lines also will appear before the commission. The Erie filed an application for exemption before either of these roads, and it is understood that the roads of the Central freight territory, such as the Wabash and the Pere Marquette, contemplate entering the fray.

Meanwhile, according to counsel for one of the roads concerned, the New England roads have opened negotiations looking toward a settlement of the case, which was in the courts for more than a year previous to the final decision by the Supreme Court upholding its validity last summer, without further litigation. While they have not indicated just what measures they will take to counteract the effects of the move by the Jersey Central and the Delaware & Hudson, it is believed that these lines will bring forward proposals of their own for increased divisions even over the present rates.

The New England lines affected include the New York, New Haven & Hartford, the Central New England, the Boston & Maine, the Central Vermont, the Rutland, the Maine Central, and the Bangor & Aroostook. The last-named road did not participate in the benefits conferred by the decision on the rest of the New England group.

The "New England divisions" situation grew out of a decision handed down by the Interstate Commerce Commission in 1922 awarding these roads approximately 15 per cent higher returns than they had previously obtained on through freight traffic. The decision was sustained in the Supreme Court last August, but at that time the court indicated that, although the decision was just in its general application to the situation, individual roads should be permitted to seek relief from its provisions.

New Rate War in Northwest

A freight-rate war is in sight on coal from western Kentucky to the Northwest, having been started by a low rate instituted by the L. & N. to points on the M. & St. L. in Minnesota and South Dakota, which are 80c. to $1 lower than rates on other lines. A similar reduction is promised to points on the Chicago Great Western which would affect southeastern Minnesota and Iowa points. It is asserted that if these reported low rates are continued it will cut off Illinois and Indiana mines from the business of the Northwest. There is general displeasure being voiced by many coal interests and railroads.

Oppose Building of 50-Mile Coal Line by M. K. & T.

Examiners of the Interstate Commerce Commission oppose the building of a 50-mile branch line into the Henryetta (Okla.) coal fields by the Missouri, Kansas & Texas R.R. The company uses oil-burning engines and asserts that it might be forced back into coal burners at any time and would need its own coal supply. The examiners say there is an adequate coal supply for the railroad and to open a new coal field would cause overproduction.

Mine-Rating Case Hearing May 19

Hearings in the mine-rating case, postponed from April 23, will be held by the Interstate Commerce Commission May 19. Commissioner Aitchison will preside.

Coming Meetings

Chamber of Commerce of the United States. Twelfth annual meeting at Cleveland, Ohio, May 6-8. Secretary, D. A. Skinner, Mills Bldg., Washington, D. C.

Illinois Mining Institute. Annual meeting, June 12-14 from St. Louis via boat down the river. Secretary, Martin Bolt, Springfield, Ill.

National Exposition of Coal Mining Equipment and Machinery of the American Mining Congress, May 12-17, Cincinnati, in conjunction with the annual meeting of the National Coal Association.

West Virginia Coal Association. Annual meeting May 13-17, Cincinnati, Ohio. Secretary, W. H. Cunningham, First National Bank Building, Huntington, W. Va.

National Coal Association. Annual meeting, May 14-16, Cincinnati, Ohio. Executive Secretary, H. L. Gandy, Southern Building, Washington, D. C.

Mine Inspectors Institute of America. Annual meeting, Sinton Hotel, Cincinnati, Ohio, May 14-16. Secretary, Martin Bolt, State House, Springfield.

Retail Coal Dealers Association of Texas. Nineteenth annual convention, May 20 and 21, Vernon, Texas. Secretary, C. R. Goldman, Dallas, Texas.

Pennsylvania Retail Coal Merchants Association. Twentieth annual meeting and exposition, Commercial Museum, 34th and Spruce Sts., Philadelphia, Pa., May 22-23. Secretary, W. M. Bertolet, Reading, Pa.

International Railway Fuel Association. Sixteenth annual convention, May 26-29. Chicago, Ill. Secretary-Treasurer, J. B. Hutchinson, 600 Michigan Ave., Chicago, Ill.

The American Society of Mechanical Engineers. Spring meeting May 26-29, Cleveland, Ohio. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

American Wholesale Coal Association. Annual convention, White Sulphur Springs, W. Va., June 3-4. Secretary, G. H. Merryweather, Chicago Temple Bldg., Chicago, Ill.

The National Foreign Trade Convention. June 4-6, Boston, Mass. Secretary, O. K. Davis, 1 Hanover Square, New York City.

National Retail Coal Merchants' Association. Annual meeting, Hotel Virginian, Bluefield, W. Va., June 4-6. Secretary, Walter D. Rogers, Transportation Building, Washington, D. C.

Southwestern Interstate Coal Operators Association. Annual meeting June 10, Kansas City, Mo. General Commissioner, W. L. A. Johnson, Keith & Perry Bldg., Kansas City, Mo.

Illinois & Wisconsin Retail Coal Dealers Association. Annual meeting, June 10-12, Delavan, Wis. Secretary, I. L. Runyan, Great Northern Bldg., Chicago, Ill.

American Society for Testing Materials. Annual meeting, Chalfonte Hotel, Atlantic City, N. J., June 23-27. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

New Equipment

Rubber-Jacketed Portable Electric Cable

A heavy-duty portable cord with unusual tensile strength has been developed by the United States Rubber Co., 1790 Broadway, New York, for use under severe conditions. This cable is especially suitable for electric light extensions, and for use with portable electric tools. Much of this kind of cable is now in use on cable-reel locomotives, and in electric storage battery charging stations. When the cable is made up of two conductors, polarity identification is made possible by the use of different colored compounds used upon the individual wires. The two conductors are twisted together and the interstice filled with cotton to make the complete cable round. The outer jacket is of special rubber compound for resisting wear and the deleterious effects of acids and oils.

Hook Stick Makes Fusing Safe

A convenient and safe means of opening and closing the circuit of insulator and expulsion type cutouts, also for renewing fuses or for performing other operations is afforded by a combination safety plug puller and switch hook recently designed by the General Electric Co.

The device consists of a fitting

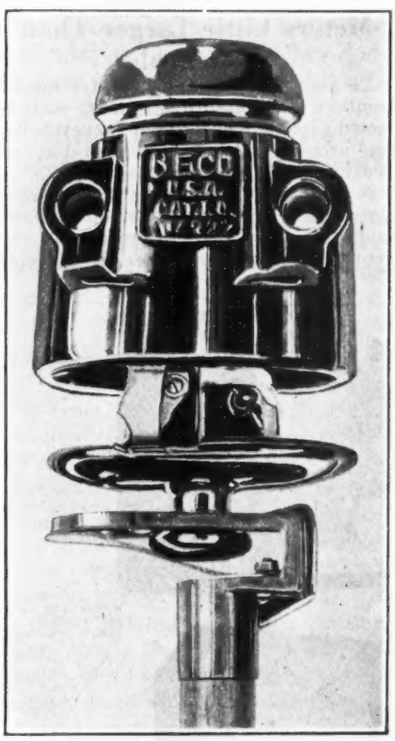


Fig 1—Safely Removing Fuse Plug

The fitting on the end of the pole securely grips the plug, and a slight pull easily withdraws it. There is no need to touch any part of the cutout until it is safely removed from contact with the line wires.

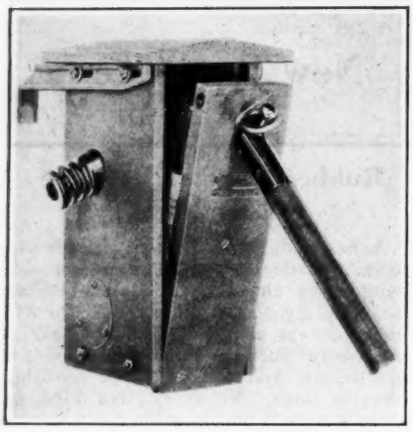


Fig. 2—Opening Fuse Compartment By Hook Stick

The use of the pole makes the opening of a fuse box of this type safe, the fitting on the end of the pole being specially adapted for this service.

mounted on the end of a treated maple pole. The enlarged portion of a slot in the fitting is slipped over the knob of the cutout plug, it is then guided to a position at the end of the slot where it is securely held by means of a spring. The puller is readily removed from the plug by a slight upward pressure and side push. The use of the puller makes it unnecessary to touch the plug with the hands at any time during its removal or replacement in the cutout.

A standard switch hook, mounted at the other end of the pole is designed to operate such expulsion type cutouts as are equipped with ring handles for this purpose. The device is suitable for use on circuits of 7,500 volts or less.

Meters Little Larger Than Their Scales

To meet the growing need for instruments which require minimum switchboard space and which nevertheless are accurate and easily readable, the Weston Electrical Instrument Co. of Newark, N. J., has recently developed a complete line of instruments of rectangular shape. All the meters of this group have uniform cases 5¾ in. wide.

The scale on the new meters is the same size as in the instruments with round cases yet the switchboard space requirement of four instruments mounted side by side is about three-quarters that required for the round instruments. The illustration shows how this economy of space has been accomplished.

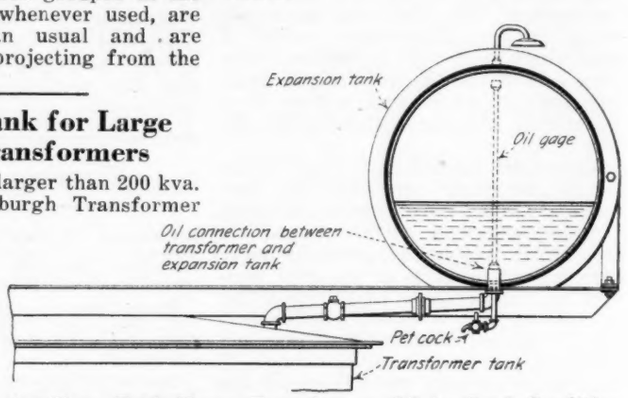
Where separate ammeters are required, as on three-phase circuits the triplex instrument, shown in the illustration, is useful. Larger and heavier scale numerals together with increased scale openings have greatly increased their legibility.

The wiring studs in the rear of the instruments have been grouped in the center. Resistors, whenever used, are much smaller than usual and are mounted on studs projecting from the rear.

Expansion Tank for Large Capacity Transformers

All transformers larger than 200 kva. made by the Pittsburgh Transformer Co. are air-tight and can be equipped with the new improved expansion tank recently designed by the company.

The tank minimizes the entrance of dirt and dust into the transformer oil; prevents rusting of the inside of the transformer tank; eliminates explosions due to ignition of any gas in the transformer; minimizes chance of moisture getting into the main tank, because a sump is provided in the expansion tank to drain off moisture; gives longer life to the insulating materials; and protects the oil from oxidation, thus tending to prevent sludging. The transformer tank can be completely filled with oil, thereby increasing the radiating surface due to the contact of the oil with the cover. Thus excessive heating and sludging of the oil is materially reduced.



Auxiliary Tank Keeps Transformer Oil in Good Condition

The pipe connection between the transformer tank and expansion chamber extends above the bottom of the latter, thus preventing moisture passing into the transformer. A pet cock at the bottom of the expansion tank drains off any water which gets into the oil.

General Utility Type Drill

A new portable electric drill called the Speed Way drill has been placed on the market by the General Electric Co. A special series-wound motor, built so that the torque varies inversely with the speed, makes the stalling of the machine practically impossible even under the most severe working conditions.

Gears on the drill are made of heat-treated alloy steel, and run in grease. The control switch is located under the operator's thumb, is simple in design, and does not arc. The drill is manufactured in several sizes to suit demands.

New Rectangular-Shaped Switchboard Instruments

Left—Wattmeter, and ammeter with cover removed.

Center — New instrument superimposed over round pattern showing scale openings and how same scale length was preserved.

Right—Triplex ammeter.

Industrial Notes

In connection with numerous other improvements being made at the plant of the **Covel Smokeless Coal Co.**, at Covel, W. Va., a shaker screen is being installed by the Roberts & Schaefer Co., of Chicago. The general office of this company is at Tams, W. Va.

The Cincinnati branch office of the Stephens-Adamson Mfg. Co. will, in the future, be in charge of Walter E. Harris, who for years has been the district manager at the Huntington (W. Va.) office, and is therefore widely known in the trade as an engineer and salesman of conveying and coal-tipple machinery. Mr. Harris will continue to head the Huntington sales. The engineering staffs of the company at both offices will be enlarged.

Willis C. Lincoln has been appointed Western sales manager of the **Electric Service Supplies Co.** with headquarters in that company's Chicago office. Mr. Lincoln has resigned from his former connection as manager of sales and engineering for the National Railway Appliance Co., New York.

The Simplex Wire & Cable Co., Boston, Mass., is enlarging its facilities for the manufacture of paper-insulated cable, a new four-story building with 40,000 sq.ft. of floor space having been constructed for the purpose. Increased storage space and larger laboratory facilities also are to be provided. The company's "Tirex" portable cord plant likewise is to have added facilities by the addition of 30,000 sq.ft.

The manufacturers of Strom ball bearings have changed the name of the company from the U. S. Ball Bearing Mfg. Co. to the **Strom Ball Bearing Mfg. Co.** No changes have been made in the personnal of the company, which is located at 4527-67 Palmer St., Chicago, Ill.

Lack of snow and rain in the Sierra Nevada Mountains threatens to reduce substantially the hydro-electric output of California, with consequent effect an economic conditions. Steam plants which are being rushed into service are said to be unable to meet the demand.